

Public (1895) Department.

ORDINARY MS.

G.O., No. 553

Dated 18 4-88

Pub 128-816 117 17

109
1004

[Despatch Abstract.]

Sanctimony, with
a grant of Rs 600 to surg.
Capt. R. H. Elliot to enable him
to continue his expts. for the discovery
of a remedy against malaria.

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.
	Cus 366/99 (889)						
	Cus 3065/98 (897)						

Public (1898) Department.

CURRENT No. 910



From
Surgen-Major-General
C. Sibthorpe, C.B., F.R.C.S.,
Surgeon-General
with the Govt. of Madras.
No. 215

Dated the 22 March 1898

Received 7 3 3-98
Registered 7
Enclosures One
Spare copies

SUBJECT.

Forwarding with strong
for a netion letter
Surgen-Major-General R. H. [unclear]
applying for a grant of [unclear]
to cover the expenditure for
fresh series of experiments
connexion with cure for
snake poisoning.

Ask for copies of S. Cap. Elliot's
papers or reports containing the
results of his previous experiments.

M. 3. 98.
No. 743 of 19-3-98.

The S. Cap. is requested to
Main submit to Govt
copies of papers or reports
by S. Cap. Elliot which
contain the results of his
previous experiments.

M.
8/2/98

To the S. Cap. (V)

Sub. 26-11-85: 2757 mis.
 28-6-86: 1330 mis.
 28-10-87: 1472 mis.
 31-7-88: 754 mis.
 28-11-90: 819 mis.

BACK PAPER [10]

G.O.	No.	Department.
996	726-7-97	

FURTHER PAPER

G.O.	No.	Department.

No.

216 8
 OFFICE OF THE SURGEON-GENERAL WITH THE
 GOVERNMENT OF MADRAS,
 Madras, 28th February 1898.

From

SURGEON-CAPTAIN R. H. ELLIOT,

SECRETARY, SURGEON-GENERAL WITH THE

GOVERNMENT OF MADRAS,

Madras,

To

THE Surgeon-General with the
Government of Madras

SIR,

I have the honor to inform you that I am now setting on foot a fresh series of experiments in connection with a cure for snake poisoning.

I need not remind you that Fraser in England, Calmette in France and other workers in various parts of the world have been busy the last few years in work of a similar kind, and you are also well aware that the natural facilities for such investigations in India are far in excess of those at the disposal of the European workers.

The Government of India has so its appreciation of such work by helping Fraser to obtain supplies of venom. In the circumstances I would venture to

ask you to forward with your favourable support this my application for a grant in aid of my research.

I calculate that a grant of Rs. 600 would enable me to do a year's vigorous, and I venture to hope, useful work.

It would cover the cost of purchase and feeding of animals, erection of a suitable shed for inoculation etc, purchase of instruments and pay of assistants.

A full and accurate account of expenditure would be furnished by me.

In submitting such a request, it is perhaps right that I should remind you that this is the 6th series of original investigations I have undertaken during the 6 years I have served in India, viz:-

- (1) Experiments of bullet wounds of the abdomen in 1892 and 1893.
- (2) Experiments on strychnine as an antidote for cobra poison in 1894.
- (3) Experiments on strychnine as an antidote for Datura Krait and Echis poisoning in 1895.
- (4) Experiments on the inoculability of Madura foot for ascertaining if it is mutually inoculable between animals and man in 1897, and
- (5) Experiments with Fraser's Antivenin also with Calmette's

(6) the present series.

It is hardly necessary to tell you that these investigations, which have been outside the pale of my official duties and done in my spare time, have put me to considerable expense, the only return for which has been the knowledge that I was working in the interests of science and for the benefit of my fellow creatures.

I am aware that the present is a time of financial stress, but the sum I ask for is so small and the possible advantages so great, that I believe they will appeal to the large sympathies of Government.

The work will be done in my spare hours and will in no way interfere with my legitimate duties.

I have the honor to be,

Sir,

Your most obedient Servant,

R. H. Willis.

Resident Surgeon

Secy, Surgeon General
with the Govt of Madras.

W. H. P.

LI

[1]

No. 215

OFFICE OF SURGEON-GENERAL

WITH THE GOVERNMENT OF MADRAS,

Madras, 5th March 1898

From

SURGEON-MAJOR-GENERAL C. SIBTHORPE, C.B., F.R.C.P.I.,

SURGEON-GENERAL WITH THE

GOVERNMENT OF MADRAS,

To

THE HON'BLE THE CHIEF SECRETARY TO GOVERNMENT,

Public DEPARTMENT.

SIR,

I have the honor to forward for the favorable consideration of Government the accompanying letter from Surgeon Captain N. H. Elliot, my Secretary, applying for a grant of Rs. 600 to cover the expenditure for a fresh series of experiments in connection with a cure for snake poisoning which he is now setting on foot.

2. This officer has already carried on at his own expense some most important and instructive investigations which proved that the use of strychnine as an antidote to cobra poison was a myth and even highly dangerous.

3. He gives in his letter a list of all the original investigations he has undertaken during the 6 years he has served in India and it is most desirable in the interest of science that he should be encouraged

as much as possible in the prosecution of
his good and useful work.

4. As shown by him his request is
not without a precedent and as the amount
asked for is very small I strongly support
his application for the sanction of Govern-
ment.

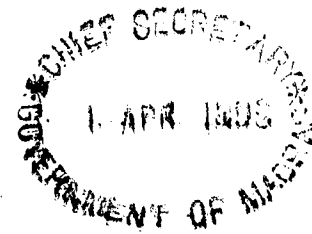
5. The work will be done in his
spare hours.

C. S. Thorpe. ✓
Surgeon-General.

Order

Public (1898) Department.

CURRENT No. 1015



From

Surgeon-General
C. S. Thorpe Esq., FRCP

No. 273

Dated the 28th March

Received

Registered

Enclosures

Spare copies

SUBJECT.

Forwarding copy of a report
by Surgeon Captain B. H. H.
on the sample of wet and
were sent out by

Professor Fraser of Edinburgh
etc

6

BACK PAPERS.

G.O.	No.	Department.	Date.

FURTHER PAPERS.

G.O.	No.	Department.	Date.

27th 28/3/98.
Report on sample of Professor Fraser's antivenene.

Current No.267/6 of 1896
Service F

Current No.267/C of 1896.

4 monkeys were taken on January 31st 1896.

Monkey No.1. received 1 drop of Cobra poison. About 2 hours later he appeared to be ill, and it was thought that his eyelids were drooping & that he was showing the malaise of Cobra poison.

He, however, improved & seemed quite well 2 hours later, and again 4 hours later still, he was apparently well.

24 hours after the 1st injection, he was found to present well marked signs of snake poisoning, viz: drooping lids, disinclination for food, and general malaise.

48 hours after the injection the monkey was much better, but at the seat of inoculation there was a swelling as big as a small orange, & from the puncture mark a sanguineous fluid exuded.

72 hours after the injection monkey nearly well; swelling as before.

It was not originally intended to use monkey No.1, as he had been partly rendered immune to snake poison on a previous occasion as the following will show. The notes refer to this same monkey.

Experiments on a monkey with a view to produce immunisation against Cobra venom, by the repeated inoculation of small but increasing doses of Cobra venom.

August 9th	hypodermic injection of 1/100 gr. of Cobra poison
" 22nd	" " " 1/100 " " " "
" 30th	" " " 1/90 " " " "
September 10th	" " " 1/80 " " " "
" 16th	" " " 1/80 " " " "
" 24th	" " " 1/75 " " " "
October 5th	" " " 1/75 " " " "
" 11th	" " " 1/60 " " " "

N.B.- 1 drop of Cobra poison-1 grain or thereabouts.

During

During the earlier experiments the animal showed well marked signs of cobraism, but these were practically absent in the ~~latter~~ later ones, seeming to show that an immunity was becoming acquired. On the night previous to that arranged for the tests with antivenin, 2 monkeys died and therefore this partly immunised animal was brought in to act as the control monkey, under the idea that any immunity he had acquired had now passed off.

On January 31st 1896.

Monkey No.2. received 1 drop of Cobra poison.

30 minutes later, he received an injection of 1000 of antivenin.

again 30	"	"	"	"	500	"
again 30	"	"	"	"	500	"
again 30	"	"	"	"	500	"

The animal now showed signs of cobraism, & 30 minutes later was given another 500 of antivenin. For some time its fate seemed doubtful, but it gradually recovered, & the same evening appeared quite well. The next morning the animal was in its usual good health.

48 hours after the first injection: animal seems well, the place of the cobra injection is marked by a large bluish swelling, which looks as if it might slough.

72 hours after the first injection: as in previous note.

On January 31st 1896.

Monkey No.3 received 1 drop of cobra poison.

30 minutes after this 500 of antivenin were injected as before into the subcutaneous tissue. This was followed at 30 minutes intervals by the injection of 3 doses of $2\frac{1}{2}$ 00 each, & again 30 minutes later by a similar dose. The animal appeared very ill, soon after the poison was injected, but was thought a little better, a few hours later. Even before the experiments began it was unwell, & it died the same night.

On January 31st 1896.

Monkey No.4 received 1 drop of Cobra poison,

30 minutes later it received 100 of antivenin (this being nearer the dose for its body weight but still a large dose for it), & at 3 minutes intervals it received 3 doses each of a $\frac{1}{2}$ 00. Like Monkey No.2 this animal for some time appeared to be running into cobraism, & also appeared to receive benefit from the antivenin. He got much better in a few hours & next morning was in his usual health, as far as I could judge.

48 hours after the first injection: animal seems well - local features as in Monkey No.2; so also 72 hours after 1st injection

injection.

This animal died on February 21st.

88p
The poison used in the above experiments was extracted by me with every care from a large Cobra seemingly in very excellent health. The glands were dissected out and the poison was then expressed drop by drop. 2 watch glasses were taken & into each 4 drops of poison were carefully measured. The glasses were then carefully put away & labelled. 6 days later the poison in the glass was dissolved in 20 minims of water and the total quantity very carefully divided evenly between the Monkeys No. 1, 2, 3, & 4 in the above experiments.

In order to control the antivenin, a large pie-dog was taken and into its subcutaneous tissue were injected doses of the same strength as those given to Monkey No. 1, and at the same intervals as that animal received his injections.

The dog became decidedly sick, & suffered from slight fits of shivering, but recovered in a few hours & went away quite well the next day.

The antivenene had a peculiar & very offensive smell, but did not produce any ill results at the seat of inoculation, in any of the animals on which it was used.

98p
II.

In order to control the above experiments and to show whether the Monkey No.1 was really immune or not, a second series of experiments was made on February 6th, in the presence of Surgeon-Major Dymott, & Surgeon-Captains Giffard, Palk & Robertson.

Monkey No.1 of the first series was taken, together with 2 fresh monkeys of larger size than himself.

Into each of these animals was injected 1 drop of Cobra poison. This poison was that taken from the same Cobra as the poison previously used in the first set of experiments. It was in fact the poison I have referred to in the last page as being put into one glass & unused at the time of series No.1.

Like the poison of No.1 series it was dissolved in 20 drops of water. 5 drops of the solution were then injected into each of the three animals above referred to (into the subcutaneous tissue of the abdomen in the 2 fresh ones & into the thigh of the previously experimented on animal; the later course was necessary as in the site of the old injection in this Monkey, there was a huge raw surface left by the local action of the previous dose of Cobra poison.).

The 2 fresh animals died of typical Cobraism. The first lived in all 90 minutes after the Cobra injection & the second lived 150 minutes. The discrepancy in time may be explained by the fact that the first animal only weighed 3 lb while the 2nd weighed 5 lbs. They were both heavier, however, than the Monkeys of series No.1 which only scaled about 2 to 3 lbs.

10
While the other 2 animals were thus dying the previous protected animal (No.1 of series 1) though he had received the same dose of Cobra venom, never showed a sign of malaise and was removed to his quarters in good health, more than 48 hours after his inoculation with the poison.

this
On February 7th animal showed signs of Cobraism, from which he would probably have recovered but for the fact that

on February 8th the slough separated from his abdomen and his intestines escaped through the aperture so left. He died on the night of February 8th.

The conclusion from these experiments seems unavailing.

(A) Two out of the 3 Monkeys were saved by a while the life of the 4th was prolonged by the same r. As this animal was sickly before the inoculation experiment began; it seems likely that it may have died from other causes.

(B) The previous injections of small doses of snake poison protected Monkey No. 1 of series 1, in both inoculations. The test of 2 injections of Cobra virus at so short an interval was, however, too severe.

(C) The antivenene at least did no harm, although it certainly smelt very foul. (The liquid antivenene was used throughout.)

(D) The above that necessary as laid down by Professor Frazer did not seem to materially alter the result, since the animal with a dose not much more than sufficient to protect made as good a recovery as the animal with 10 times that dose.

(Sd.) Robert Henry Elliot.

Surgeon-Captain,

April 18th 1896.

I. M. S.

(True Copy.)

Robert Henry Elliot

Madras,

25th March 1898.

Surgeon-Captain

Secretary, Surgeon-General

with the Government of Madras.

11

*The usual Monthly Meeting was held in the Central Museum,
Madras, on Friday, October 19th, at 5-30 P. M.*

—o—o—o—
SURGEON-MAJOR-GENERAL SIBTHORPE, (PRESIDENT) IN THE CHAIR.

—o—
Is Strychnine an antidote to cobra poison. Surgeon-Lieutenant
R.H. ELLIOT, M.B., B.S., London, F.R.C.S., England, D.P.H., Camb.

MR. PRESIDENT AND GENTLEMEN,

We are familiar with the statement that history repeats itself and perhaps in few branches of science is this adage so well illustrated as it is in the past and present of snake poisoning. One vaunted cure after another has come before the profession and the public only to spend its short day and then bubble-like to burst, leaving no trace behind it on the world of science.

I have been asked, why I have not been content to stand aside and watch the fate of this Strychnine-remedy, secure in the knowledge that if it be a bubble, bubble-like it must burst, while if it be all that has been claimed for it, it must and will remain a most enduring beacon founded on a bed-rock of solid fact to throw light through all time over the troubled face of the ever-changing sea of medical opinion.

Gentlemen, were I confident that the new remedy would run its course doing only good, or even doing more good than harm. I would gladly stand aside, but neither you nor I can blind ourselves to the fact that this line of treatment is fraught with the gravest danger to the lives of men, women and children. Already we have on record cases which suggest the very worst possibilities, and those too in *Thanatophidia*-bitten-patients, but what of the great army of the scorpion-stung, the rat-bitten, the thorn-pricked, and others, who coming under treatment in a state of collapse, the result of fear, may be subjected to the agonies if not the death of Strychnisation by an over-zealous and well-meaning subordinate.

Nay, more gentlemen, should it fall to the lot of any of us to render agonised the closing moments, of some valued and valuable life, should we soon forgive ourselves, and even if we did so, would the patient's friends be equally lenient? I think not.

It seems hardly necessary to remind such an audience as I have the privilege of addressing to-day of the past history of the Strychnine treatment of snake bite.

Australia which 25 years ago in the person of Dr. Halford pressed on us the acceptance of the ammonia cure, and which indignantly received our critical rejection of Dr. Halford's treatment, Australia I say to-day has left the ammonia cure behind and as confidently as ever presses on us a snake-bite-cure, but now a new one, namely, strychnine. I do not pretend to say that strychnine and ammonia are not antidotal to the bites of Australian snakes, though I must say that the evidence is to my mind far from convincing, but I will bear you all with me when I say that we in Madras at least have been far from satisfied with the reported cures that have, from time to time, been published in the Indian papers.

Two cases were brought up before our Association some months ago and the suggestion was then thrown out that if only we could carry out some experiments on animals much might be done to clear up our doubts and to place the matter on a more satisfactory basis. With an excellent zoological laboratory and trained assistants at my disposal, the opportunity to do something was too tempting to be resisted and the work that I put before you to-day has been the outcome of the suggestion I referred to.

The object that I had before me was to ascertain the value of strychnine as an antidote for snake poisoning, and two courses seemed to me to be open to the worker in this field.

The first was to experiment on the lower animals.

The second was to experiment on man.

To the latter procedure we may apply the more euphemistic term clinical observation. It must be remembered, however, that the grounds on which our action is based, are theoretical so far as Indian snakes are concerned, that Strychnine is a dangerous drug and that it is often very difficult to determine whether any case is one of Thanatophidial bite or not.

Bearing such important considerations in mind we cannot, I think, refuse to accept the term *experiment* for the Strychnine treatment of man.

Surely at the outset of such an enquiry as the one before us, the more justifiable course to pursue is to experiment on animals. Should the answer to these experiments be a favourable one, we may boldly proceed to try our remedy on man.

I propose this evening to give you first the results of my experiments on the cobra poisoned animals, and later to analyse and discuss the reported cases of the Strychnine treatment of snake-bite in man.

I am well aware that Dr. Mueller has objected to receive any conclusion drawn from experiments on animals.

Before dealing with his objection let me point your attention to his letter, dated 28th June 1890, in which in writing to the Chief Secretary of Victoria, he quotes certain experiments on animals in Russia which had proved favourable to his conclusions. These experiments he there brings forward as a strong argument in favour of his theory and yet when subsequent work points the other way, Dr. Mueller declines to own it.

His objections are based on two grounds—

(1) That the experiments previously conducted were carried out on dogs, and that one could not argue direct from one class of vertebrates to another, even though both were mammals

and

(2) That between the nervous system of man and the lower animals there is 'only a functional analogy which has been mistaken for a complete identity.'

I quote from the *Indian Medical Record* of 16th September 1892 which contains a very friendly criticism on Dr. Mueller's account of '35 years' work on snake poison.'

Before entering on my own methods, allow me very briefly to discuss these objections.

The first of them had occurred to me at the very outset of my work, and I, therefore, determined not to limit myself to one or even to two or three sets of vertebrate animals, but to choose common animals which would as thoroughly as possible represent the vertebrate kingdom, and especially the mammalia.

With this end in view the following animals were selected:—

Frogs.	Guinea-pigs,
Lizards.	Goats.
Ducks.	Dogs.
Fowls.	Pigs.
Hares.	Monkeys.

Any one possessing even the most superficial knowledge of comparative anatomy must admit that the above list is very fairly representative of the vertebrate kingdom and specially of the mammalia.

I argued and I think no one will dispute my contention, that if experiments on these various animals gave one and the same answer, one might fairly believe that man would give the same.

If I am wrong in this conclusion what, may I ask, becomes of our belief in the doctrine of Evolution, for if we admit that man and the lower animals have had a common source and that many of these in the list before you possess the closest affinities with ourselves, surely, gentlemen, it is no presumption to believe that influences which affect these animals one and all in the same manner, will affect us similarly under similar circumstances.

Even if you reject the theory of evolution the facts of Comparative Anatomy and Physiology strongly support the same argument.

Now to deal shortly with the second objection. I for one cannot accept the statement that between man and the lower animals there is merely a functional analogy. By the term 'merely a functional analogy' I understand Dr. Mueller to mean that the nervous systems of man and animals are constructed to perform the same function, and that they have nothing more in common.

No one will contend for a moment that there is absolute identity between the nervous systems of two animals even of the same species, be they man or beast, but I maintain most strongly that not only is there a functional analogy, but that there is an anatomical analogy; a physiological analogy; a pathological analogy; a clinical analogy; a therapeutic analogy, and in fact that there is every kind of analogy, between the nervous systems of man and the lower vertebrata.

Over the anatomical analogy it would be a waste of time to stay. It is too familiar to us all. As for a therapeutic and a

physiological analogy one would have thought that the researches of Brunton and other well known workers had long ago removed it from the land of speculation. Is not a great deal of our medicine and pathology to-day based on it?

It may reasonably be asked, however, What evidence is there of this universal analogy between man and the lower vertebrata in their reactions to the two poisons before us? In other words, do we find that cobra poison and strychnine respectively produce closely similar manifestations throughout the vertebrate kingdom?

In order to answer this let us compare the effects of these poisons on the animals which have been experimented on, with the well known effects of the same agents on man. They will be found to be practically identical.

A Review of the strychnine control experiments recorded in the tables before you (Appendix I) will show that the first symptom of strychnisation is a general brace-up of the nervous system. The animal in fact is on the *qui vive*, a few moments later and it becomes alarmed while its movements tend to be spasmodic. It seems unable to stand comfortably and gives one the impression that it is walking on hot bricks, suddenly a convulsion, either opisthotonic or emprosthotonic, more commonly the former, throws it down. Clonic and tonic convulsions now alternate, respiratory spasm is severe, the embarrassment of the respiratory centre is shown in the general lividity, and further in the very rapid breathing during the intervals of spasm.

The least stimulus, such as a sound or touch, brings on a fit in an animal which if left alone might lie quite still. The convulsions are attended with severe pain, and the patient dies usually in respiratory spasm or more rarely exhausted by frequent spasms. Should a fatal issue be averted, the animal rapidly recovers, the convulsive stage passing into a sleepy condition in which the nervous system seems profoundly exhausted, but in which I have never seen an animal die. So much for strychnine in animals. I think you will admit, that the picture I have endeavoured to draw from carefully recorded notes on animals, would apply equally well to man.

Now as to cobra poison.—

In frogs and lizards the only points noticeable were, that the

animal showed signs of malaise, paralysis rapidly supervened, spasms usually occurred, and life was extinguished.

Speaking generally of the mammalia experimented on, one might say that the stages passed through, are best represented by the words off-repeated in the notes.—Walking; Soon sitting down; Lying down; Dying.

The earliest symptoms noticed are drowsiness, and loss of control over the limbs, especially the hind limbs. The animal no longer moves about, and it evidently prefers to be left alone. When disturbed it soon settles down again. After a short interval the sitting posture is forsaken and soon the patient is found lying helplessly prone, paralysed and dying.

The respiration toward the end is slow but not laboured. At this stage the shallow breathing, livid colour and general condition of nervous failure suggest to me the patient we have all of us seen at one time or another brought in from a severe Railway smash. The all round nervous exhaustion exhibited in such a case from loss of blood, is here repeated as a consequence of general poisoning of the nervous centres. Like the Railway patient alluded to, the cobra poisoned animal retains its consciousness almost to the last.

Then comes the end, often ushered in by a little shudder, a clonic spasm of limbs, in no wise comparable with the strychnine convulsion and the curtain drops.

Salivation was a very common if not a constant feature of the case in the mammals experimented on. I can only regret that its very commonness led to its escaping notice in the recorded tables. In dogs, goats, pigs and monkeys as well as in the birds it was a practically unvarying symptom.

An examination of the subcutaneous tissue at the seat of the injection showed an extravasation evidently of an inflammatory nature around the seat of lesion.

In monkeys two additional symptoms were present and to these I wish especially to direct your attention. In these animals the earliest sign of cobra poison is a drooping of the upper eyelids. This becomes so marked in time that the animal

tilts his head back, and rolls his eyes down in order to see out of his pupils. This drooping is evidently paralytic. The remaining symptom is a condition frequently referred to in the notes on monkeys as *drunkenness*. The animal loses its power of co-ordination and staggers about with an extremely drunken giddy look. In one case the monkey seemed to suffer from the optical delusion that a rope was before it. This it tried to reach.

Turn now, gentlemen, to Wall's able description of a human being suffering from the results of a snake bite, and we have an exact repetition of the above story. You will find his account on Wall's Indian Snake Poison, pp. 2—4 and pp. 10—15. See also Richards' landmarks of snake poison literature, pp. 134 and 135, and the Proceedings of the Snake Poison Commission of 1873 and 1874, pp. 36—41.

Most striking are Wall's allusions to the early drooping of the eyelids and to the feeling of drunkenness the patient complained of. He goes on to say that the latter symptom will probably never be elicited in animals on account of their lower intelligence not enabling them to communicate it. *Est humanum errare* and in this particular Wall has justified the old saying.

Lastly one may add that an animal suffering from a heavy dose of cobra poison, does not necessarily show the drunken stage, but passes rapidly from drowsiness with drooping eyelids into a rapidly fatal end, attended with shivering convulsion.

These and other points that time forbids us to dwell on, will, I think, establish my contention that there is a very close analogy between the various mammalia including man, in their behaviour to the two poisons we are discussing.

With these facts before you, gentlemen, I think I shall carry you with me when I say that this analogy is not merely one of function, but that it embraces Symptomatology, Pathology and Therapeutics, not to speak of Anatomy and Physiology.

Starting from the basis, that man and the lower mammalia react alike to the two poisons we are considering, let us

1st investigate the effect of the two poisons when at work together on animals, and

2nd let us in like manner study the results of the similar experiments on man.

With this end in view I will now invite your attention to the results of my recent experiments (Appendix I). Of almost all of them, fewer or more of you, gentlemen, have been witnesses, and you are aware that throughout I have courted the utmost professional publicity and criticism.

That the results so obtained are of value for deductive purposes I think I may now safely assume that you all believe.

Forgive my digressing for one moment to express the regret that one cannot but feel, when one sees well-meaning but alas! mistaken people bitterly opposing *all* vivisection except that carried out on human beings. Such a position is to my mind untenable.

It is necessary at the outset to describe shortly the technique I have employed.

All the experiments have been carried out with the binocellate cobra (*Naja tripudiam*); but I hope at a later date to carry out a similar series of experiments with the other poisonous snakes of India.

The cobra was chloroformed in a large glass bottle. It quickly died and was then removed and the two poison glands dissected out. From these glands the poison was squeezed out and allowed to fall into watch glasses. A number of these glasses were ready before-hand, and each glass was labelled according to the number of drops it contained.

These were put away in batches carefully labelled with the date, &c.

The poison rapidly dries, solid.

When required for use a small quantity of saline solution is added to the dried poison, and this is then dissolved, drawn up into the syringe and subcutaneously injected into the abdomen.

During my earlier experiments I injected into one thigh, but gave this up in favour of the subcutaneous tissue of the abdomen as the spurious condition of paralysis produced in the injured thigh was very confusing.

Mr. Jones, Professor of Physics at the Presidency College, very kindly weighed for me a number of drops of cobra poison taken at random from those in actual use.

These drops were first allowed to dry. I will read you Dr. Jones' report.

THE PRESIDENCY COLLEGE.

MY DEAR ELLIOT,

The following are the masses of the substances submitted:—

(1)	0.011	Grammes	=	$\frac{1}{8}$ th	Grain about
(2)	0.009	"	=	}	$\frac{1}{7}$ th "
(3)	0.0097	"	=		
(4)	0.008	"	=	$\frac{1}{8}$ th	"
(5)	0.007	"	=	}	$\frac{1}{3}$ th "
(6)	0.007	"	=		
(7)	0.007	"	=	}	$\frac{1}{7}$ th "
(8)	0.009	"	=		

The differences in the masses of the drops may be ascribed to
(1) Unsteadiness of the support.

(2) Unsteadiness in the rate of flow of the liquid out of the gland.

(3) Alteration in the surface-tension of the liquid, assuming that the gland was held in the same position, and the liquid was that of the same density throughout.

After keeping two of the substances in dessicators for two days, I found very little alteration on weighing again.

Yours,
R. LI. JONES.

In the tables of experiments I have for convenience sake spoken of these drops as minims, though strictly speaking they are not minims. The variation that Dr. Jones records may I think be fairly neglected in the face of the result of these experiments.

It has been asked why I did not make the snake bite the animals, instead of injecting poison.

Any one who has spent a morning in endeavouring to make a snake strike a single animal will know how dangerous and unsatisfactory such a course is. Apart from the questions of time, and trouble, there is always the uncertainty.

(1) Whether the snake has really bitten,

2) Whether poison has been injected, for the gland may be empty or the strike may not have been a well timed one, and

(3) Whether in any series of experiments the same amount of poison has been injected in each.

For reliable comparative experiments it is necessary.

Firstly—that one should know

(a) that poison has been injected, and

(b) that the same amount has been injected in each.

Secondly—that in each case the poison be similarly injected into equally absorbent parts, equally far from the heart.

Thirdly—that the minimum fatal dose of snake poison be ascertained and given in order that the antidote may have the fullest time and opportunity for any action it may possess.

A point of great value in experiments on animals with a syringe is that we thus avoid the great and error bringing element of fright and fear of death which operates so strongly on a snake bitten man.

Having settled the minimum fatal dose of cobra poison and the rapidly fatal dose for each class of animals, I next proceeded to ascertain the full Physiological dose of Liquor Strychnia B. P., solution hypodermically given that could be injected into each class of animals, short of fatal effects.

These preliminaries settled, antidotal experiments were then undertaken. Every device was resorted to in order that the Strychnine might have the fullest opportunity of exhibiting its vaunted powers.

That this was done you will see by reference to the table of experiments in your hands. (Appendix I). In some cases the full physiological dose of strychnine was given as soon as cobra poisoning manifested its symptoms, in others the action of the snake virus was anticipated, in others small sub-physiological doses were repeated till full physiological effects were reached, while in yet others poisonous doses of liquor strychnina were administered.

I regret to record that in no case did strychnia however administered save life. In the whole 33 antidotal experiments I have not one single case of recovery to tell of.

If you will turn now to Appendix III, you will find in a tabular form a comparison of the relative duration of life in the various animals with and without strychnine. In the first eight cases the difference is practically negligible, in the next six it is strongly against the antidote, while in the last two there is no apparent difference.

I am far from insisting on the mathematical accuracy of these figures. Mr. Jones' report shows that the amount of poison in the drop varied in some cases, though in by far the greater number of cases it was $\frac{1}{8}$ — $\frac{1}{9}$ gr. of dry poison. It is, however, more than probable that these variations did not favour either the control or the antidotal experiments taken as a whole.

Much must also be allowed for the individual idiosyncrasy of any particular animal, as experience often showed me, and yet allowing for all this, I think that one plain lesson is to be learnt, viz., that given an animal with a *poisonous* dose of cobra poison, the subcutaneous injection of strychnine often hastened death very markedly, while it never could be said to materially retard it.

It would seem that death may be hastened by the antidote in two ways.

- (1) By increasing the force and frequency of the circulation and thus aiding the diffusion of the virus,
- (2) By the exhausting reaction which strychnine undoubtedly produces on the nervous centres.

Most of you were witnesses of the experiments and I would feel obliged if you would state your opinions on these moot-points which undoubtedly are of very considerable interest.

Strychnine at the bar of these experiments has failed to prove its case as a saviour of life but, gentlemen, I go a step further and impeach it on the threshold of its claim to any antidotal power whatever.

I believe that the antidotal action said to exist between strychnine and cobra poison is a delusion and a myth.

Before proceeding to the hard region of fact allow me to deal with Dr. Mueller's contention on theoretical grounds.

That gentleman in his letter, dated Melbourne, 28th June 1890, to the Chief Secretary of Victoria, states:—"That snake poison is

a specific nerve poison depressing and in fatal cases suspending the functions of the motor and vasomotor nerve centres, and that this action is purely dynamic—it follows as a matter of necessity that if snake poison depresses the functions of the above named centres, the successful antidote must be a remedy that stimulates the centres to increased functional activity. This remedy is strychnine."

Now if you have once proved the statement that strychnine and cobra poison respectively stimulate and depress the identical same centres, you may confidently anticipate that they will exert on each other an antidotal Physiological action, but is this the case?

Strychnine I take it is a comparatively simple substance and its action can be the more easily estimated.

Cobra poison, on the other hand, is on a different footing entirely. Little as we know of it we have already grounds for believing that it consists of at least two poisonous substances, one of which acts in such a way as to excite the motor portion of the nervous system and produce convulsions, while the other depresses the nervous system. Either of these separately is fatal. For all we know, and this opinion is held by able chemists, the poison possibly consists not of two but of many poisonous substances.

Turn now from chemical composition to the symptoms of the two poisons. Are they the exact complements the one of the other?

Time does not allow the thorough dealing that this subject demands, but I think that anyone who gives the matter careful thought will admit that while the strychnine avowedly acts chiefly if not entirely on the motor centres of the cord, cobra poison shows the clearest evidence that at a very early stage it affects the higher sensorial centres, and probably the cerebellum. How else can we account for the drowsiness, giddiness and other allied symptoms?

Now, gentlemen, let us leave the airy region of theory for the more solid ground of observed fact, and ask ourselves the question. In actual reality do we find that strychnine shows itself in a modified form in a cobra-poisoned animal, or that cobra poison modifies its power before strychnine?

Set the strychnine control experiments side by side with the antidotal experiments and you will observe the following facts:—

1st, that symptoms of strychnine poisoning manifest themselves as early after the injection of strychnine in the one case as in the other.

2nd, that in the early stages the convulsion of strychnine are as violent in one case as in the other.

3rd, that in the later stages animals die from cobra poison with typical symptoms and yet the least touch evokes an undoubted strychnine tremor in the animal up to within a minute of death. An intermediate stage occurs in which the victim starts on the least touch or sound but has not the *vis* to respond with a convulsion.

4th, that under the influence of a poisonous dose of strychnine the animal dies as surely when fully under the influence of cobra poison as it does when no such poison has been given. See experiments 93, 94, 95, 96, 97 and 98.

A very noteworthy point is illustrated by several experiments in which though the animal was so deeply under cobra poison that its exhausted nervous system could not produce a spasm, yet a fatal dose of strychnine precipitated the inevitable end.

This to my mind is a very different thing from physiological antagonism or antidotal action. It is not that the two poisons counteract each other in any beneficial sense, but that the cobra poison has so exhausted and depressed the nervous system, that the motor cells and muscle fibres can no longer respond to the strychnine stimulus with their accustomed violence, though that stimulus is amply sufficient to kill the exhausted animal.

5th, that in some cases, *e.g.*, 11, 29, and 51 Strychnine administered in physiological doses seemed actually to determine at once the impending fatal issue.

6th, that in an animal poisoned with cobra virus, strychnine may produce a temporary stimulation and so may give rise to a fallacious appearance of improvement. I have watched this sign with hope on several occasions, but alas! those hopes have ever been doomed to disappointment.

Cobra poison 'bides its time,' like the knight of old, but like him too, when the time comes to strike, when in fact the virus would have killed in the absence of any contretemps, it claims its victim as

surely as fate. Strychnisation then passes into cobra asthenia, and do what you will with your drug, the curtain drops. The action of the poison forcibly reminds one of those little lines.

The mills of God grind slowly
But they grind exceeding small,
They may seem to pass us over,
In the end they grind us all.

I now turn to the second division of the subject before us, *viz.*, the records of experiment on man. It will be well to premise this part of our subject by a short description of the symptom of cobra, krait and daboia poisoning as observed by men for whose evidence we one and all have the profoundest respect.

My object in so doing is to enable us to distinguish the true symptoms of snake poisoning in the cases before us from the mass of symptoms which are constantly and erroneously attributed to snake poisoning.

Shortly then we may say that the signs and symptoms of cobra poisoning are as follows:—

Locally.—Stinging, burning pain; wound may become swollen, red and painful on pressure.

An interval now occurs ranging in observed cases from 15 minutes up 4 hours the average probably 1 hour.

Exceptionally symptoms may begin at once.

First constitutional symptom—a feeling of intoxication.

Then.—Drooping of eyelids.

Loss of power in legs,

Inability to stand.

Later.—Loss of power of speech. Paralysis of tongue and larynx.

Falling of lower jaw.

Profuse salivation.

Nausea, retching and vomiting.

Still later.—General spread of paralysis.

Suffocation by saliva threatens.

Muscular twitchings.

Respiration slow and shallow.

Consciousness retained in some cases, lost in others.

Finally.—Respiration ceases.

Heart continues to beat.

For the above details I am indebted to Wall's Indian Snake Poisons, pp. 10-14. From the same author we learn the following details about other snakes.

Daboia Russelli. Local signs and pain in wound much more marked in bites by Daboia than in cobra bites, and there is a large amount of blood effused. Otherwise the two wounds are alike.

In the constitutional symptoms of Daboia poisoning we note certain points differentiating it from cobra poison.

1st.—Convulsions are violent and constant at an early stage, but do not necessarily prove fatal. They are quite unlike the convulsions possibly of dyspnœal origin which usher in death in cobra bite.

Respiration is at first hastened, and does not so soon become slow and shallow as it does under cobra poison influence. It is very irregular in character.

Pupil widely dilated by the Daboia virus.

Salivation far from common.

Bloody discharges, and albuminuria are the rule.

After the nerve symptoms pass off a period of blood poisoning ensues which may last for days and very often eventually proves fatal. Hemorrhage and hiccup attend this period.

In Bungarus bite death takes place in one of two ways.

Either at once by symptom indistinguishable from cobra, except by the fact that the interval between the bite and the incidence of symptoms is here longer than in cobra bite or later after an incubation period of 26 days by symptoms of blood poisoning.

The bite of *Echis carinata* is said to resemble that of Daboia but to be less deadly.

Having in this way cleared the ground I would ask you to turn to the analysis of the recorded cases, which I have made, and copies of which are handed round to you all.

I would divide these cases primarily into two sets.

(A) Those in which the patient was undoubtedly bitten by a

poisonous snake this being proved 1) by his death with typical symptoms, or (2) by the snake being caught and identified by trustworthy and competent authority.

(B) Those in which the patient recovered and the snake was not identified.

I shall deal with these classes in order, beginning with class A. Out of a total of 42 recorded cases we find a fatal result in 7, viz., in cases 1, 2, 3, and 7, 8, 9, and 10, (Appendix IV) nor can the antidotal drug be said to have been spared in any of these cases, not even in case 2 in my opinion. Very telling is Hospital Assistant Misra's observant remark that he found strychnine a failure in those cases in which speech was affected. This paralytic failure of speech is a well known symptom of snake poisoning and points to the fact that these fatal cases, and they only, were *Thanatophidial* while the rest were spurious. Further it is to be remembered that fatal cases may very likely have escaped publication, as human nature shrinks from recording its failures.

Now let me turn to the cases in which the poisonous snake was caught.

I think, gentlemen, that with the correspondence in the *I. M. Gazette* before us, not one of us will hesitate to exclude Dr. Banerji's cases from this list.

I may further add that Dr. Banerji very kindly sent me a consignment of snakes.

Of these he labelled two specimens as *Daboia Russellii*, one *Daboia elegans* and one *Daboia*—(something, which I can't read).

The bottles with his own labels are before you and you will have no difficulty in ascertaining that they are every one typical specimens of *Echis carinata*, a much less virulent snake.

Another snake he labelled as *Bungarus coeruleus*. This diagnosis seems incorrect. The snake is 4 ft. 9 ins. long and, as far as the colour can be distinguished (the specimen is decomposing), it is banded some dark colour and yellow. It is probably *B. fasciatus*.

Another snake was labelled *Ophiophagus elaps*. It is merely a dark cobra.

Two specimens of the harmless tree snake *Psammophis bithüi*, are labelled *Callophis Pentalineatus* and *Callophis Gracilis* respectively.

The *callophis* is a very deadly snake allied to the krait. I may say that Dr. Henderson and Mr. Thurston have confirmed in every respect my opinion as to the nature of these snakes. I thank them both for the trouble they have taken.

Nor can I include No. 28, Assistant Surgeon Fitzpatrick's case as the diagnosis there avowedly rests on native opinion than which nothing can be more fallacious.

I recently had a good specimen of *Dendrophis Pictus* (the original is before you), sent me by an educated and very intelligent native pupil who assured me that the snake was believed to be more deadly than the cobra.

With Dr. Giffard's able assistance I experimented with this snake on guinea-pigs which are very sensitive to snake poison. The snake seized and shook the little animals making them cry loudly but with entirely negative results.

Case 27 is recorded by one well known as a careful and trustworthy observer, Surgeon-Lieut-Col. Oswald Baker, but that officer particularly calls attention to the absence of symptoms and in no way ascribes the recovery to the very small dose of strychnine ($\frac{1}{10}$ gr.) that he gave.

Case 30 by Surgeon-Major Thomas cannot be relied on as that officer acknowledges to having left the treatment in the hand of his Hospital Assistant after himself giving two injections. The amount of strychnia injected also seems very uncertain.

Case 31 is an interesting contribution to snake poison literature. It is in every respect carefully noted and recorded. The animal was *sans doute* a cobra, but the prompt and efficient local treatment rapidly adopted is in itself probably sufficient and accounts for the cure.

Surgeon-Major Evans met with a similar case in his own practice in which early local treatment saved an undoubted case of cobra-bite, and possibly under the same head is to be included Dr. Hehir's recent case.

In the case (31) before us not one symptom of cobra poison is recorded if we exclude drowsiness, and, with characteristic fairness and openness, the recorders note that they nearly lost their patient from strychnia poisoning which indeed they nearly did.

As to the drowsiness I have noted in strychnia control experiments on animals that, after the symptom of strychnisation have passed off, drowsiness invariably and very naturally ensues.

To this point Dr. Giffard and others of you who saw my experiments can, I know, speak.

Case 32 very courteously contributed in a private letter by Surgeon-Lieut.-Colonel Waller-Barrow is too scanty to found much of an argument on. The snake was nipped and probably quite unable to strike efficiently.

In any case no symptoms of snake poison are recorded.

Lastly we have a very recent contribution in Case 42. Here the animal was a young cobra only 16 inches long, and like all young cobras very vicious withal. Strychnia was freely given in 3 large doses without any avail. Indeed we learn that the patient got worse and worse. After the 4th injection, and 4½ hours after the bite, the patient began to mend and in another 2½ hours was much better.

The only note of immediate improvement recorded is that muscular spasms commenced. My experience from experiments prevents me from considering this *ipso facto* a true sign of improvement, and I fail to be convinced, as the case now stands, that the improvement was more than *post hoc*. At the most, it may be claimed that strychnia acted like any other cardiac, and respiratory stimulant would have done, but that there was any specific antidotal action I cannot admit.

It is however a valuable addition to our knowledge and would have been much more so had the symptom been more carefully noted in those last 2½ hours.

Pregnant with meaning in connection with this case, and with case 25 are Dr. Wall's words which I extract from p. 94 of his valuable book; "in cobra poisoning" he says "if the victim does not succumb soon, a complete recovery is to be anticipated."

Let us now turn to the second class or class B in which the snake was not caught and the patient recovered.

These cases can be divided into 2 classes.

- (1) Those showing signs of snake poisoning,
- (2) Those showing no such sign.

For convenience sake we will dispose of the 2nd division first.

Case 4 reads to me like a typical case of fright. Surgeon Captain Giffard relates the history of a man brought under his care in a state of profound collapse, under the impression that he (the patient) was bitten by a snake. Brandy and the assurance that a scorpion was the offender wrought a complete cure. How much more violent and effectual would have been the recovery had strychnia been substituted for Brandy!

Cases 5, 6, 11, 12, 13, 14, 15, 16 are too scantily reported to be of any value in evidence.

Cases 17-21. Present no marked symptom of snake poisoning or at least none such are recorded if we exclude three cases in which 'drowsiness and giddiness' are mentioned. I think we can hardly put much stress on these symptoms alone. The recoveries too are too rapid even for the most sanguine strychnia advocates in this country, the longest recorded case being cured in three hours. This taken with the smallness of the strychnine dose used, the scantiness of the clinical notes and the absence of identification of the snakes will lead most critics to reject these cases as valid evidence.

Case 22 had a large assortment of treatment with a little strychnia thrown in, but his symptoms are amply covered by the supposition that he was deathly frightened.

Case 24 presented no symptom that fear will not account for. Only ½ gr. was given and recovery was attained in two hours.

Case 25 too seems to have been merely a case of fright, no symptoms of snake bite presenting themselves.

Case 28 powerfully suggests hysteria. Only 15 grs. of strychnia was given. The patient was a female *æt.* 35.

Case 29. The evidence is scanty as to

- (1) Nature of snake and
- (2) Presence of snake poisoning.

Cases 33-38 have already been dealt with. I fear we can lay but little stress upon them. The same uncertainty must necessarily surround all cases by the same writer.

Cases 39, 40 and 41 must fall in for their share of suspicion.

Case 39 reads to me like an intoxicated man who injured his foot or else received a harmless bite on it.

Cases 40 and 41 differ strangely from the experience derived from experiment and from one case which was probably viper bite recorded by Wall, convulsions and typical hemorrhage are conspicuous by their absence, as is also the intense local pain of viper bite.

Hospital Assistant Misra's 3 cases recorded in I. M. Record, 12th October 1894, are of no value. The snakes were not caught, the notes are scanty and the symptoms doubtful.

A few cases remain in which the history of the case suggest thanatophidial origin.

Case 23 reads like a slight case of snake-bite. The fact that seven hours elapsed before it came under treatment is suggestive of the idea that the dose was not a severe one. In the recurrence of the symptom on the third and fourth day, it would seem that a neurotic element played a part.

Case 25 was also probably a slight one of snake poisoning. The absence of subcutaneous infiltration warns us that at least the dose was not large, even if the bite was thanatophidial. Dr. Vaughan's idea that cobra poison does not cause such injection is directly opposed to the experience of Wall, and in this particular I can certainly bear that observer out, having constantly noted subcutaneous infiltration in animals even with diluted cobra poison. Dr. Vaughan noted that he administered .3 gr. in 50 minutes without improvement. After another .1 gr. gradual improvement commenced. Was this *post hoc* or *propter hoc*? At least here we see none of that sudden disappearance of all symptoms over which Dr. Mueller is so jubilant in his cases.

Case 42 is ably discussed by the Reporter. The fangs of the snake seem not to have penetrated, and it is doubtful how far the symptoms were due to cobra bite. Dr. Sargent notes that hysteria and fright were strong elements in the case, and he does not hesitate to show us how nearly he lost his patient by over strychnisation. It is to be regretted that all men are not equally honest.

Finally it is noteworthy that Dr. Sargent does not credit strychnine

with saving the case, though he thinks it hastened recovery. Very probably Brandy or any other stimulant would have done the same.

Case 44 seems to have recovered from cobra poison and strychnine. In 1½ hour, $\frac{2}{3}$ gr. of strychnine was given, and the patient was then left to the mercies of his friends. During the next six hours, he grew worse and worse, though the jerking of the limbs showed he was under the influence of strychnine, for at least four hours of that time. Eventually nature prevailed, the two poisons were excreted and the man rallied.

I have endeavoured gentlemen, fairly but critically to review these cases. My aim has not been, and is not, to persuade any one of you to adopt the view to which I myself, have been driven, but I hope rather that I may have been able to place facts before you and to allow you to judge, each one for yourselves.

For my part before I can accept the conclusions, Dr. Mueller would force upon us, I must know of at least one recorded case,

(1) in which a well grown poisonous snake struck a man, woman or child,

(2) In which that snake was identified by a reliable authority and proved possess fangs and a poison sac, or in which in another case fatal result followed a bite by this same snake.

(3) In which symptoms of undoubted snake poisoning appeared and were definitely removed by the administration of strychnine.

I cannot accept cases in which strychnine was given and after an indefinite period 'the patient got better.'

No such cases are forthcoming and to my mind while experiments on animals condemn, experiments on man do not definitely and distinctly support Dr Mueller's treatment.

I can only quote the words of one who rendered me valuable and valued assistance while I re-echo Dr. Dymott's sentiments. "If I am bitten by a snake, I will at least not superadd to my suffering the agonies of strychnisation. Let me die in peace."

It may be that words have fallen from me to-day which seem unkind to fellow-workers in this great and important field. If so I can assure them that my intention was not to wound, but the

interests at stake are such that I have felt it incumbent upon me to be 'faithful to truth' at all costs.

If to any I seem an idol-breaker, I would ask them to believe that in breaking their idol, I have broken my own, for I set out on this quest in the hope and belief that at least there was a strong nucleus of truth in the stories that garlanded the strychnia treatment of snake bite. I have been rudely undeceived, but what profit is it to any one of us to nurse a jackass in the delusion that it is a form of beauty. It is better to awake from such a dream at once.

In conclusion I must thank the many who have accorded me valuable and willing help.

My best thanks are due to the Surgeon-General and the many officers of the I. M. S. and others who at the sacrifice of valuable time, came and witnessed the experiments on this subject. By so doing they have set on this work the stamp of genuineness which had it been less public, many might have held it to lack.

I would thank Surgeon-Lieut.-Col. Allison for much courteous help with the proof sheets and other details. Surg.-Capt. Thomson for so readily and valuably assisting me with all the information in his power. Mr. Jones, Professor of Physics at the Presidency College, for very kindly weighing specimens of poison for me. Mr. Thurston and Dr. Henderson for ready assistance in the identification of snakes, and Mr. Sambu Siva my assistant professor and Mr. Govindan my demonstrator for much willing and able help. Lastly but far from least I would tender my very best thanks to two officers of the I. M. S. who stinting neither time, labour, nor pains, gave me almost throughout my work, their constant and most practical help. By their clear headed advice and ever useful suggestions they contributed in no small measure to any success my work may have attained. I need not say that I refer to Surgeon-Major Dymott, and Surgeon-Captain Giffard.

The PRESIDENT made the following remarks:—

GENTLEMEN,

We have all heard with great interest the valuable paper by Surgeon-Lieutenant Elliot, a careful record of successfully made experiments some of which I with others of you, have had the oppor-

tunity of seeing carried out. I am sure we, who saw these experiments, will all agree that they could not have been more thoroughly performed or in a more scientific spirit than Dr. Elliot showed. These experiments I consider clearly shew that the antidotal power of strychnia in cobra poisoning as claimed for it by Dr. Mueller does not exist and moreover, that in using it we are dealing with a dangerous remedy which itself is very likely to prove fatal, if not administered with the greatest caution and under the closest personal observation. The Government of India not being satisfied that the result of the experiments submitted to it were conclusive enough have ordered further trials and further reports. I consider it would be most desirable that these investigations of Dr. Elliot should be given as wide a circulation as possible for the information of those medical officers who may have the opportunity of carrying out such further investigations in order to show them how necessary it is that such experiments should be carried out with great care and in a true scientific spirit.

Brigade Surgeon Lieutenant-Colonel W. PRICE said:—

MR. PRESIDENT AND GENTLEMEN.—As I was one of those who enjoyed the privilege of witnessing many of the interesting experiments upon which the valuable paper we have just heard read has been founded I feel that it is my duty to say a few words.

First of all, I wish to thank Surgeon-Lieutenant Elliot for his kindness in having asked me to attend and next to bear witness to the care, accuracy and skill with which the numerous experiments were carried out and the results recorded. I was present on three days, and three different sets of experiments. I watched them carefully and I am now fully satisfied that not only is Strychnine not an antidote to cobra poison but that, on the contrary, it actually hastens the end, and it does that in a most unpleasant way for the patient. If I were unfortunate enough to be bitten by a cobra, I would most certainly not let any one inject me with Strychnine; neither would I permit any cobra poisoned patient of mine to be so tormented. I certainly think that these experiments not only justify but necessitate, in the interests of humanity, that Government should withdraw its order sanctioning experiments with Strychnine on cobra poisoned human beings. Dr. Vincent Richards, in his valuable little book on "Landmarks in Snake Poisoning",

gives some very simple practical directions for the treatment of these cases which might with advantage be made more widely known. The intelligent policeman or village official would be much less likely to do harm with a piece of india rubber tubing than with a hypodermic syringe and a solution of Strychnine. I may state that when serving in the Nellore District, a very snaky place, I used to go about with a piece of india rubber tubing in my pocket, but though I served there nearly four years, I never got an opportunity of using it.

One point in the experiments that interested me greatly was the well marked "*currant jelly*" condition of the tissues surrounding the cobra poison injection. It was so well marked that no one could mistake it for a moment. Vincent Richards lays great stress upon this point in the diagnosis of a poisoned bite from a non-poisonous one, and also upon the removal of all this "*currant jelly*" tissue in the treatment of the former, yet, as well as I remember, this is a point that is seldom touched upon in either a cured or fatal case. It ought certainly to be widely known.

As a matter of personal faith, I believe, that the deaths from snake-bite are very much exaggerated, and that the figures put down under this head include many murders of sorts. I have lived in India and Burma for over twenty-three years and during that time have served all over the country from Palamcottah in the South, to Nowgong, Central Provinces, in the North, and from Mangalore in the West to T'oungoo, Burma, in the East, and in that time have seen only four cases of snake-bite, not one of which was fatal. Two of them were brought in in an apparently unconscious state; but when I found that this had come on *immediately* they had been bitten I did not put it down to snake poison. They recovered without Strychnine. You may say that cobra bite is so rapidly fatal, there is seldom time to bring the patient to the Medical Officer for treatment. Granted; but it seems to me that if deaths from snake-bite were as common as they are said to be, I ought to have seen a corpse in my varied and fairly long service.

I noticed that Dr. Elliot spoke of injecting into the abdomen in preference to the thigh. We know he means the subcutaneous tissues of these parts, but it might be as well to say so.

Surgeon-Lieut.-Colonel Browne said :—

Having had the privilege of witnessing the experiments on monkeys made by Surgeon-Lieutenant Elliot, I would like to state that I fully agree in the main with the conclusions that he has drawn from the experiments. To my mind they are quite conclusive as to the utter uselessness of strychnine as an antidote to cobra-poisoning in animals. There could be no doubt whatever that instead of in any way alleviating the symptoms or delaying the approach of death, strychnine made the animal suffer a great deal more than it otherwise would, if the cobra-poison had been allowed to act *per se*, and further strychnine undoubtedly hastened the onset of death.

In no way could strychnine be said to show any power as an antidote and no matter how the experiments were devised, the result was always the same; namely, a painful and more speedy death when strychnine was used than when it was not. Dr. Elliot has said that Surgeon-Major Dymott expressed his decision not to be injected with strychnine should he ever be bitten by a venomous snake, and I certainly am of the same opinion, and should I ever have the misfortune to suffer from snake-bite, I shall certainly not allow any one to inject strychnine into me—as long, at any rate, as I retain consciousness. Before sitting down, I should like to add that the experiments were throughout conducted in a thoroughly scientific spirit, and Dr. Elliot was always anxious that every medical man who cared to do so should witness as many of the experiments as possible. Further, I think that means should be taken to publish the admirable paper that we have just heard read, so that it may reach a wider circle than our own Branch, especially as the matter is still under reference by the Government of India—and also because, as far as I know, no such valuable series of experiments has been undertaken either in India or elsewhere as the one, the delivery of the record of which we have just had the privilege of listening to.

Surgeon-Lieut.-Colonel H. ALLISON said :—

I also had the privilege of witnessing some of the experiments carried out by Surgeon-Lieutenant Elliot and desire to add my testimony to the great care with which the experiments were conducted. I fully agree with the conclusions drawn from them that Strychnine is not an antidote to cobra poison.

Surgeon-Captain GIFFARD said:—

SIR,—Having been privileged to witness not only some but nearly the whole of Dr. Elliot's experiments, of the many points that have struck me, I consider the greatest and the most significant to be, that in not one single instance has recovery taken place in any animal, with or without strychnine, into which had been injected one drop of cobra poison. Had there been a single doubtful case I should have considered it a call for more experiments, but as matters now stand the "case" for strychnine must be considered "closed" at least as far as animals are concerned. Of the remaining points I am so convinced of the danger of the use of strychnine; I say *use* advisedly, for of the danger of its abuse there can be no doubt, that I consider that not only would that drug fail to cure cases of poisoning by cobra poison in which the dose was such as to ensure death, but also I greatly fear that it may be found to cause death in those cases in which the dose was such that, if no treatment was adopted, recovery would or might ensue. I take it, that the profound shock and subsequent nervous depression and drowsiness always seen after marked strychnisation would militate very considerably against the recovery of those cases that might be considered, as it were, as the border line between recovery and death. I consider Strychnine in animals to be not only "*no antidote*" but also a no problematic *danger* to the slightly poisoned cases. I would also remind the meeting that Dr. Elliot's method of giving Strychnine was no hard and fast rule, but with every endeavour to give the drug fair play, it was given in single and in multiple, in small and in large doses. Some of the members now present will remember that having been asked by Dr. Elliot towards the end of the experiments whether any one still had a lingering hope that some especial manipulation of the dosage of strychnine might perhaps save one case, he then carried out the suggestions made and as before stated with the monotonously invariable result "death."

The following letter has been received from Surgeon-Major Dymott, who was present at most of the experiments.

TRIPATUR,
15th November 1894.

MY DEAR ELLIOT,

I am sorry I was unable to be present when you read your paper. I saw so many of your experiments that it would be a failure of duty if I did not bear witness to the care and persistency with which you conducted your operations.

The results seemed to be so conclusive that before you had finished one-fourth of your experiments I really thought that the question under consideration was sufficiently settled. In no case, where strychnine was injected after cobra poison, was there the slightest evidence that the strychnine in any way prolonged life.

Though you have undoubtedly proved that strychnine is not an antidote to cobra poison, the evidence in those cases where human beings have been bitten by snakes and treated with strychnine, does not so clearly show this. There must be some reason for the apparent discrepancies in the results, and, on reading your paper, I at once noticed an important difference in the two classes of cases. Your experiments on animals were all made with a syringe, in order, as you say, to avoid the great and error-bringing element of fright and fear of death. In the cases quoted, where human beings were bitten, we may reasonably suppose that there existed this element of fright and fear, and, though strychnine may not be in the slightest degree an antidote to cobra poison, it may, and probably does, help to remove the condition produced by fright and fear.

There are, however, other equally efficient and far less dangerous remedies.

Your experiments have furnished still another instance of the benefit to mankind resulting from vivisection on the lower animals.

Yours faithfully,

DONALD F. DYMOTT.

I. While these sheets were passing through the press, I was fortunate enough to secure a fine specimen of a Russell's Viper. Experiments were made with this on guinea-pigs and strychnine was fully tried.

The results so far as they went, showed the utter uselessness of trusting to the so called antidote, not one animal seemed even benefited by it, and indeed my positive impression is that it is more harmful in treatment of viper bite than in that of cobra poisoning.

II. On November 14th, a krait was obtained and experiments were conducted on two guinea-pigs. The pig to which strychnine was administered died almost at once after the injection, death being obviously hastened by the remedy.

R. H. ELLIOT.

Appendix I.

Experiments on the antidotal effects of Strychnine in Cobra-poisoned Guinea Pigs.
May 1894, Presidency College, Madras.

No.	Character of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks, etc.	Interval between 1st Injection and Death
I. 16-5-94.	Control cobra poison experiment on Guinea pig.	Cobra poison (subcutaneously in left thigh).	" i.	30 mins.	No signs of distress, just voided urine.	Full sized pig.	
				35 do.	Moves when disturbed, Left leg drawn up to body.	P. M. Both sides of heart and the venous system were distended with blood.	
				42 do.	Paralysed in limbs, lies on belly won't move. P. 140 against 120 before injection. Very dull.	Auricles still feebly contracting.	
				46 do.	Slight spasm of trunk. R. 60 against 110 before injection.		
				48 do.	Slight spasm of left hind leg. Very restless, nose and lips dusky, Lateral decubitus. Scarcely any pupil reflex.		
				50 do.	Heart beats 84, i. regular. Inspiration gasping.		
				53 do.	No pupil reflex. R. ceased. Heart still beating.		
				54 do.	Heart stopped.		53 mins.

May 1894, Presidency College, Madras.—(continued.)

No.	Nature of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks, etc.	Interval between 1st Injection and Death.
II. 17-5-94.	Control Strych. experiment on Guinea pig.	Liq. Strych. B. P.	m ii ss.	5 mins. 7 do. 47 do.	Slight convulsion. Fixed and staring, curious tremor affected the animal especially its head. This run on to violent emprosthotonus, with all limbs extended backwards, the animal lying on its belly. Pig died after a series of spasms.	Full sized pig.	47 mins.
III. 17-5-94.	Control Strych. ex- periment on Guinea pig.	Liq. Strych. B. P.	m i.	11 mins. 14 do. 31 do. 39 do. 57 do.	Ran about excitedly struggling convulsively. Slight attack of convulsion. Fixed look. Slight tremor of the head. Tremors have been frequently repeated. No attacks for last 15 minutes.	Full sized pig.	
IV. 18-5-94.	Control Strych. ex- periment on Guinea pig.	Liq. Strych. B. P.	m ss.	24 mins. 31 do. 33 do. 54 do. Next day.	No signs present. Occasional slight spasm increased by any interference. Severe opisthotonus. Has had repeated opisthotonic convulsions since last note. Has been put into a box and left. Alive, a little cheap.	Did not die.	
V. 18-5-94.	Control cobra poison experiment on Guinea pig.	Cobra poison.	m ss.	17 mins. 32 do. 41 do. 43 do. 45 do.	A little weak in hind quarter. rather sluggish. Much the same. Weak and slack. Hind legs paralysed. Had a sudden fit of convulsions when disturbed. Convulsions emprosthotonic with kicking of limbs. R. slowed. R. ceased. No pupil reflex. Heart beats, 132. Heart ceased.		43 mins.
VI. 18-5-94.	Antidotal experiment on Guinea pig.	Cobra poison. Liq. Strych. (B.P.) Liq. Strych. (B.P.)	m ss. m ss. ... m ss.	13 mins. 16 do. 25 do. 28 do. 30 do. 35 do. 38 do.	Sluggish. Left leg drawn up. Much more active. Slight twitching. No more twitching since last note. Slight twitching again. Slight convulsion, lay on belly and kicked. Spasm of neck and lower jaw, ventral decubitus. R. ceased. It. ceased 1 minute later.		38 mins.

Experiments on the antidotal effects of Strychnine in Cobra-poisoned Guinea Pigs.
May 1894, Presidency College, Madras.—(continued).

No.	Nature of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks, etc.	Interval between 1st Injection and Death.
VII. 18.5.94.	Control Cobra poisoning experiment on Guinea pig.	Cobra poison.	m i.	10 mins. 14 do. 30 do. 33 do.	Slight convulsion of post. extremity. Distinctly weak in hind limbs. Very do. Has lain prone for 1 minute. Emprosthotonus now commenced.		36 mins.
VIII. 18.5.94.	Antidotal experiment on Guinea pig.	Cobra poison, m i. Liq. Strychnine (B.P.) m ss.		11 mins. 21 do. 32 do.	Slight twitching, seems slack and cheap. Uses hind legs fairly well, seems stronger.		
		Liq. Strychnine m ss. do. m ss.		35 do. 39 do.	Beginning to get very weak. Getting very weak indeed. Convulsion followed the injection at once.		
				41 do.	Respiration became very slow and		
IX. 19.5.94.	Control Cobra poisoning experiment on Guinea pig.	Cobra poison, m j.		16 mins. 28 do. 35 do.	Well and very active. Seems poorly, does not eat, mopes in a corner. Getting very weak losing control over limbs. Nose on the floor.	Small pig.	40 mins.
				36 do. 38 do. 40 do.	Slight general convulsion. Severe convulsion, lateral decubitus. Death.		
X.	Control Strychnine experiment on Guinea pig.	Liq. Strychnine m ss. nine (B.P.) Liq. Strychnine m ss. nine.		12 mins. 16 do. 22 do. 24 do. 27 do. 42 do.	Convulsive movement commencing. Very temporary opisthotonus. Has remained very jumpy; springs suddenly in the air. Violent opisthotonus commenced. Death.	Small pig.	42 mins.
XI. 19.5.94.	Antidotal experiment on Guinea pig.	Cobra poison, m i. Liq. Strychnine m ss. B. P. Liq. Strychnine m ss.		14 mins. 26 do. 28 do. 36 do. 38 do. 40 do.	Seemed well and active at the time. Eating and running about, and enjoying life immensely. Getting a little jumpy, remains on one spot. Getting very weak, falling over to one side. Convulsion ensued almost at once. Breathing ceased, pupil insensitive	Small pig. (1) Death seemed hastened by interference. (2) Strychnine, death not due for another 16 mins. Compare last experiment.	40 mins.

Experiments on the antidotal effects of Strychnine in Cobra-poisoned Guinea Pigs.
May 1894, Presidency College, Madras. — (continued.)

No. of Experiment.	Character of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., observed.	Remarks, etc.	Interval between 1st Injection and Death.
VII. 19-5-94.	Antidotal experiment on Guinea pig.	Cobra poison. Liq Strych. B. P.	m i. m i.	15 mins. 20 do. 41 do. 43 do. 52 do. 62 do. 74 do.	No sign of poisoning at the time. Fixed look, slight twitch. Began to settle down. Has been twitching at intervals. Walking round, rather feeble. Very weak lies prone. Drooping to right side. Found dead. Probably some minutes dead. It escaped notice.	A large guinea pig. Size probably influenced result.	

Experiment on the antidotal action of Strychnine and Cobra Poison in Hares. (Lepus Nigricollis). Method used is the same as in previous experiments with Guinea Pigs. May 1894, Presidency College, Madras.

XIII. 19-5-94.	Control cobra poison experiment.	Cobra poison (subcutaneously injected in belly-wall).	m i.	1 hr. 1 do. 5 mins. 1 do. 10 do.	Seems very limp. Taking an interest in life, but not quite himself. Tremors of anterior extremity commencing, and very weak in hind quarters.		70 mins.
XIV. 19-5-94.	Control cobra poison experiment.	Cobra poison (subcutaneously injected in belly-wall).	m j.	1 do 12 do. 1 do. 15 do. 1 do. 17 do. 1 do. 25 do. 1 do. 27 do.	Has sunk on to his nose. Has sunk on to his side. Slight clonic convulsion. Died. Before death, breathing gradually became very slow and laboured, and there was a succession of mild convulsions; heart continued to beat strongly after; respiration ceased. Evacuation of faeces and bloody urine.		1 hr. 25 mins.
XV. 19-5-94.	Control strychnine experiment.	Liq Strych. B.P. (subcutaneously injected in belly-wall).	m i.	40 min. 55 do. 1 hr. 15 do. 1 do. 23 do. 1 do. 27 do. 1 do. 29 do. 16 mins. 21 do. 22 do.	Hare is decidedly quiet. Respiration 48; irregular; animal quiet. Fallen on one side; tremor; limp. Convulsion. Respiration stopped; no pupil reflex; heart beating. Heart action stopped. Hare rose to his feet; twitched and seemed uneasy. Violent tonic opisthotonus followed by clonic spasms. Died.		1 hr. 27 mins. 22 mins.

Experiments on the antidotal action of Strychnine and Cobra Poison in Hares (Lepus Negricollis) Method used is the same as in previous Experiments with Guinea Pigs. May 1894, Presidency College, Madras.—(continued.)

No. of Experiments.	Character of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., observed.	Remarks, etc.	Interval between 1st Injection and Death.
XVI. 19-5-94.	Control strychnine experiment.	Liq. Strych. B. P.	m ss.	17 mins.	Hare has been rushing about all over the laboratory; it attempted to leap out of the window (some 4 ft. high), but several times the jumps proved abortive and convulsive; at last he cleared the window falling. The animal was convulsions ensued. <i>died</i> in marked opisthotonus, passing faeces and urine 52 mins. after first injection.	The animal would probably have lived much longer, but the fall brought on convulsions.	52 mins.
XVII. 21-7-94.	Control Strychnine experiment.	Liq. Strych. (B. P.)	m ss.	15 mins. 22 do. 31 do. 34 do. 55 do. 1 hr. 30 do.	Well at time of injection. Jumpy; respiration rapid and shallow. Jumps at a touch; tremor of ears which are cocked. Opisthotonic convulsions followed a touch. Sitting up; better; very excited respiration rapid. Recovering rapidly. Recovered.	Kept very quiet throughout.	Recovered.

XVIII. 19-5-94.	Antidotal experiment.	Cobra poison Liq. Strych. B. P.	m i. m ss.	40 mins. 45 do. 50 do. 56 do. 1 hr. 0 do. 1 do. 3 do. 1 do. 15 do. 1 do. 30 do. 1 do. 35 do. 1 do. 42 do.	Very cheap at time of 2nd injection. Has livened up wonderfully. Great activity. Hare makes huge leaps. Still intensely 'awake.' Seems electrified. Back muscles are rigid. Pupils dilated. A marked tetanic spasm. His limbs are failing to support him now. Violent clonic opisthotonic spasm. An emission of urine. Spasms, tonic and clonic occur at intervals. Very curious type of respiration, the diaphragm seeming to be in a condition of fluttering spasm 192 times per minute. Signs of strychnisation are wearing off fast. Respiration steadier. 126 per minute. Died.		1 hr. 42 mins.
XIX. 19-5-94	Antidotal experiment.	Cobra poison. Liq. Strych. B. P.	m i. m ss.	36 Mins. 43 do. 58 do. 1 hr. 13 do. 1 do. 35 do.	Very cheap at times of Strychnine injection lying down on one side. Has sat up since injection. Is very quiet. Respiration 120 per minute. Has fallen on side and is very limp. Died.		1 hr. 35 mins.

Experiments on Fowls (body weight = 3 lbs ±).

No. of Experiment.	Character of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noticed.	Remarks.	Interval between 1st Injection and Death.
XX. 11-7-94.	Control Strych. experiment on large black hen.	Liq. strych. B. P.	m 4	30 mins.	Seemed drowsy. Nothing more. Comb pale.		
		Liq. Strych. B. P.	m i	1 hr. 30 do.	Quite well. No symptoms of strychnine have appeared.		
				3 hrs. 0 do.	No symptoms throughout.		Recovered.
XXI. 11-7-94.	Control Strych. experiment on large black hen.	Liq. Strych. B. P.	m 4				
		1 cc. do.	m ii	26 mins. 1 hr. 27 do. 1 do. 36 do.	Pale. Sleepy. Nothing more. Quite well. Seems very thirsty. Weak on legs. Throat flapping rapidly.		
				1 do. 53 do. 2 hrs. 2 do. 3 do. 2 do. 8 do. 3 do. 10 do.	Two convulsions - not severe. Two more convulsions. Sleeping. Head drooping. Convulsions. Recovering. Standing up. Nothing further. Recovered.		Recovered.

XXII. 11-7-94.	Control Strych. experiment on a large black and white cock.	Liq. Strych. B. P.	m 4				
		Do. do.	m iii	1 hr. 13 mins. 1 do. 24 do. 1 do. 28 do. 1 do. 50 do. 2 hrs. 35 do.	No result. Quite well. Sitting down. Throat jerking. Sleepy. Opisthotonus. Hurried breathing. Since last note, there have been a series of convulsions (opisthotonic). Breathing spasmodic. Severe convulsions from time to time. From this time on, the convulsions became less severe, and the animal became drowsy and recovered.		Recovered.
XXIII. 12-7-94.	Control Strych. experiment on large black hen.	Liq. Strych. B. P.	m iv	2 mins. 2½ do. 5 do. 7 do. 8 do. 11½ do.	Opisthotonic convulsions. Rapid breathing. Eyes shut. Salivation. Convulsions continue. Repeated convulsions continue. Permanent opisthotonic rigidity. Dead.	Had received 1¼ min. of Liq. Strych. on previous day. See experiment XX.	11½ mins.
XXIV. 11-7-94.	Control Cobra Poison experiment on large red cock.	Cobra poison injection. (Poison two months old.)	m i	1 hr. 1 do. 13 mins. 1 do. 38 do. 1 do. 58 do.	Sleeping soundly. Seems asleep. Head drooping. Head resting on ground. Can be easily roused. Raised head, flapped wings convulsively, head fell again. Legs seem paralysed.		

Experiments on Fowls (body weight = 3 lbs. ±) — (continued).

No. of Experiment.	Character of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noticed.	Remarks.	Interval between 1st Injection and Death.
XXIV. (contd.) 11-7-94.	Control Cobra Poison experiment on large red cock.			2 hrs. 7 mins. 2 do. 23 do. 3 do. 8 do. 3 do. 18 do. 3 do. 28 do. 4 do. 0 do.	Sitting up pluming himself. Sometimes seems ill and gasps, at other times sits up and plumes feathers. Slight convulsion. Jerked wings once, then tried to stand but fell down, head flat, gasping. Lying flat, breathes slowly. Still alive. Occasional jerks. Left moribund. Found dead next morning.		More than 4 hours.
XXV. 11-7-94.	Control Cobra Poison experiment on red hen.	m ii		6 mins. 10 do. 20 do. 24 do. 25 do. 28 do. 29 do. 30 do.	Sat down heavily. Standing up, looks sleepy. Eyes shut. Head falling on table. Stood up, but soon sat down again. Beak resting on table, head flat. Convulsions. Fell off table. Violent convulsions. Died.	Smaller than most of fowls used.	30 mins.

XXVI. 11-7-94.	Control Cobra Poison experiment on large, strong cock.	m ii		11 mins. 20 do. 35 do. 1 hr. 0 do. 1 do. 10 do. 1 do. 15 do. 2 hrs. 0 do. 2 do. 15 do.	Was nearly suffocated by Peon during injection. Drank water. Can stand, but soon sits down. Head resting on ground. Can be roused easily. Very difficult to rouse. Can't be roused. Breathing very slowly. Head flat on table, gasping. Do. do. do. saliva dribbling from mouth. Practically dead. Dead.	Large strong animal. No convulsion throughout.	2 hrs. 15 mins.
XXVII. 11-7-94.	Antidotal Cobra and Strychnine Poison experiment on black hen.	m ii m i m i m i	Cobra Poison Liq. Strych B. P. Po. do. Do. do.	20 mins. 31 do. 35 do. 38 do. 40 do. 41 do. 43 do. 44 do. 50 do.	No symptoms. Sitting down drowsy, eyes shut. No change. Flapped wings, opened eyes, looked round. Sitting down. Beak on table. Eyes shut. Injection followed immediately by convulsions. Settling down, wings extended. Beak on table. When touched rapid convulsive tremors ensued. Convulsions.	Larger than animal in Expt. XXV. Smaller than that in Expt. XXVI.	

Experiments on Fowls—(continued) (body weight=3lbs±.)

No. of Experiment.	Character of Experiment.	Nature of Injection.	Dose.	Time elapsed since first injection.	Symptoms, etc., noticed.	Remarks.	Interval between 1st injection and Death.
XXVII. —(contd.) 11-7-94.	Antidotal Cobra and Strychnine Poison experiment on black hen.	Cobra Poison Liq. Strych. B. P.		1 hr. 0 mins. 1 do. 7 do. 1 do. 13 do.	Convulsion, head flat, eyes shut. Dying, but jerks violently when touched. No corneal reflex. Dead.		1 hr. 13 mins.
XXVIII.	Antidotal Cobra and Strychnine experiment on black hen.	Cobra Poison Liq. strych. B. P.	m ii m i	10 mins. 14 do. 18 do.	Well at time of injection. Fell down with wings outspread. Weak at time of injection.	A Fine large bird.	
		do. do.	m ½	36 do.	Throat jerking the last 4 minutes. Respiration rapid, sitting down, wings spread.		
		do. do.	m ½	46 do.	Drowsy. Jerks and flaps wings on any stimulus. Beak resting on floor. Jumps on any stimulus.		
		do. do.	m ½	53 do.	Beak resting on floor. Difficult to rouse.		
		do. do.	m ½	57 do.	Strychnine jerks can be elicited with difficulty.		
				58 do.	Appears to be dying. Respiration difficult. Comb blue.		
				59 do.	Strychnine jerks becoming more marked.		
			1 hr. 0 do. 1 do. 3 do. 1 do. 20 do.	Convulsions. Dead. Well under strychnine to the last.			1 hr. 20 mins.

XXIX.

Antidotal Cobra and strychnine experiment on big black hen.	Cobra Poison Liq. Strych. B. P.	m i m ii	21 mins. 25 do. 32 do.	Well at time of injection. Do. do. do. Throat jerking. Respiration rapid. Head flat. Looks very ill. Trembling all over.			
			34 do. 51 do. 55 do.	Spasms when touched. Opisthotonic convulsions. Do. do.			
			57 do.	Seems dying. Lying flat.			
	Liq. Strych. B. P.	m i	1 hr. 0 do. 1 do. 2 do. 1 do. 4 do. 1 do. 7 do.	Opisthotonic convulsions. Do. do. Do. do. Dead.			1 hr. 7 mins.

Experiments on Ducks.

XXX. 11-7-94.	Control Strychnine Experiment on Drake	Liq. Strych. B. P.	m i.	3 mins. 4 do. 7 do. 15 do. 23 do. 27 do. 1 hr. 0 do.	Runs about. Rather too active. Losing balance. Tips backwards and forwards unsteadily. Prefers to be left alone. Very jerky in walk. Disturbed. Fell on back. Convulsions. 3 convulsions since last note. Repeated emproathotonic convulsions. Recovered to a great extent. Can walk. Found alive and well next day.		Recovered.
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No. of Experiment	Character of Experiment	Nature of Injection	Dose	Time elapsed since 1st Injection	Symptoms, etc., noticed	Remarks	Interval between 1st Injection and death.
XXXI. 12-7-94.	Control Strychnine experiment on Drake.	Liq. Strych. B. P.	m i.	10 mins. 20 do. 21 do. 23 do. 45 do.	Has been unsteady on his legs the last 5 minutes. Unsteady. Foot doubled up. Walks lamely. Tremor followed by opisthotonic convulsion. Rapid Respiration. Clonic convulsion. Has been in an almost constant state of opisthotonus since last note.		
				1 hr. 5 do. 1 do. 11 do. 1 do. 25 do. 1 do. 50 do. 2 hrs. 15 do.	Emprosthotonus: Rapid respiration. <i>It statu quo antea.</i> Sitting up, much better. Can stand now, is much better. Quite himself again.		
XXXII. 11-7-94.	Control Strychnine experiment on Duck.	Liq. Strych. B. P.	m ii.	6 mins. 25 do. 33 do. 36 do. 42 do. 1 hr. 27 min.	Got up quacked, very lively, 'on wires.' Rather staring. Disinclined to move. Walks rigidly with slight tremor of body. Fine tremor all over body, lower back trembling. Uneasy. Staring. Walks convulsively when disturbed. Recovering rapidly. No convulsions. Head steady well.	Exceptional Resistance to Strychnine.	Recovered.

XXXIII. 11-7-94	Control Strychnine experiment on duck.	Liq. Strych. B. P.	m iii.	1 min. 10 mins. 14 do. 17 do.	Got up, quacked very lively, 'on wires.' Opisthotonus; quacking. Opisthotonus continues. Tonic and clonic. Spasms succeed each other. Dead.		17 mins.
XXXIV. 11-7-94.	Control cobra experiment on duck.	Cobra poison.	m i.	8 mins. 22 do. 29 do. 30 do. 1 hr. 0 do. 1 do. 32 do.	Well at time of injection. Legs yielding, sitting down. Has been standing and sitting alternately, cannot rise now. Head flat. Slight convulsion. Has been better and worse. Now seems dying. Head flat. Dead.		1 hr. 32 mins.
XXXV. 11-7-94.	Control cobra experiment on drake.	Cobra poison.	m i.	21 mins. 24 do. 35 do. 41 do.	Well at time of injection. Has sat and stood alternately. Seems ill and dying. Feeble convulsion. B. O. Quivering, lying flat, cannot be roused. Dead.		41 mins.
XXXVI. 11-7-94.	Control cobra experiment on duck.	Cobra poison.	m ii.	6 mins. 11 do. 13 do. 19 do. 23 do.	Getting weak in hind limbs. Lying on belly, neck outstretched, cannot rise. Flaps occasionally in a convulsive manner. Lies still. Moves when cornea is touched. Dead.		23 mins.

Experiments on Ducks—(continued)—(body weight = 3lbs ±).

No. of Experiment.	Character of Experiment.	Nature of Injection.	Dose.	Time elapsed since first injection.	Symptoms, etc., noticed.	Remarks.	Interval between 1st Injection and Death.
XXXVII. 14-7-97.	Antidotal experiment on duck.	Liq. Strych. B. P.	m ii.	9 mins.	Well at time of injection. Weak. Fallen down. Got up again.		
			m i.	19 do. 22 do.	Weak at time of injection. Looks very ill. Head drooping on table.		
				28 do. 32 do.	Head flat. Dead.		32 mins.
XXXVIII. 14-7-94.	Antidotal experiment on duck.	Liq. Strych. B. P.	m i	7 mins.	Well.	Same duck as in Experiment XXXIII.	
			m i	10 do. 20 do. 25 do. 49 do. 55 do. 57 do.	Sitting down, head drooping. Respiration very rapid. Sitting down quietly. Still sitting quiet. Lying flat, not strychnised. Opisthotonic spasms at once. Dead.		

XXXIX. 14-7-94.	Antidotal experiment on drake.	Cobra poison Liq. Strych. B. P.	m i	9 mins.	Well.		
			m i	18 do. 24 do. 26 do.	Looks well. Breathing rapid. Slight strychnisation. Very rapid respiration. Convulsion.		
			m ½	32 do. 33 do.	Shivering all over. Throat flapping. Thirsty. Convulsion on slight noise.		
				34 do. 35 do. 36 do. 41 do. 52 do.	Convulsion. Sudden jerks. Throat motion rapid. Opisthotonic convulsion. Convulsion if touched. Fallen down. Dying. Can't be roused.		
				1 hr. 3 do. 1 do. 8 do. 1 do. 13 do.	Dead.		1 hr. 13 mins.

Experiments on Bloodsuckers (Calotes Versicolor) Length 16" — 18", body weight = 3 Oz.

XI.	Control Strych. experiment on bloodsucker (sub-cut. injection).	Liq. Strych. B. P.	m ½.		Jumped about violently immediately after injection.		
			m ½.	15 mins. 20 do. 30 do.	Jumped about as before. Very active. Rushing about. Twitching followed the injection at once and passed on into opisthotonus.	Large Specimen.	
			m ½.	35 do. 45 do.	Very cheap. Lies very quiet on one side of his back and twitches from time to time.		
				55 do.	Found dead.		50 min. ±

Experiments on Bloodsuckers (Colotes Versicator) Length 16" 18", body weight = 3 Oz.

No. of Experiment.	Character of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noticed.	Remarks.	Interval between 1st Injection and Death.
XLI. 14-7-94.	Control Strych. experiment.	Liq. Strych. B. P.	m. i.	2 mins.	Very active.	Large Specimen.	Recovered.
				26 do.	Twitches convulsively when disturbed.		
				31 do.	Very cheap directly after injection, prone, but rouses when touched.		
				34 do.	Clonic spasm.		
XLII. 14-7-94.	Control Strych. experiment.	Liq. Strych. B. P.	m. i.	36 do.	Do do.	Recovered.	20
				2 hrs. 21 do.	Since last note has had repeated convulsions when disturbed.		
				3 do. 10 do.	Recovered.		
					Convulsions followed Strychnine at once.		
XLIII. 14-7-94.	Control cobra poison experiment.	Cobra poison.	m. i.	15 mins.	Convulsion, seems nearly dead.	Dose too strong.	Recovered.
				17 do.	Rigid, not quite dead.		
				22 do.	Better, recovering, twitching.		
				26 do.	Recovering. Breathing regular.		
XLIV. 14-7-94.	Control cobra poison experiment.	Cobra poison.	m. i.	30 do.	Convulsion.	Dose too strong.	16 mins.
				33 do.	Do.		
				2 hrs. 20 do.	Since last note has had convulsions when disturbed.		
				3 do. 10 do.	Very cheap.		
XLV. 14-7-94.	Control cobra poison experiment.	Cobra poison.	m. i.	3 do. 45 do.	Recovered.	Dose too strong.	16 mins.
				8 mins.	Very cheap, prone.		
				16 do.	Dead.		
					Very cheap, prone.		

XLIV. 14-7-94.	Control Cobra poison experiment.	Cobra poison.	m. i.	7 mins.	Very cheap, prone.	Do. do.	15 mins.
				9 do.	Some spasms.		
				15 do.	Dead.		
					Very cheap, prone.		
XLV. 14-7-94.	Control Cobra poison experiment.	Cobra poison.	m. i.	9 mins.	Very cheap.	Do. do.	20 mins.
				20 do.	Died quietly.		
					Very cheap.		
					Very cheap, prone.		
XLVI. 14-7-94.	Control Cobra poison experiment.	Cobra poison.	m. i.	9 mins.	Very cheap.	Do. do.	44 mins.
				20 do.	Seemed dead and then recovered.		
				22 do.	Shivered and jumped.		
				38 do.	Struggling feebly.		
XLVII. 14-7-94.	Antidotal experiment.	Cobra poison Liq. Strych. B. P.	m. i.	44 do.	Dead.	Do. do.	25 mins.
					Well at time of injection.		
				8 mins.	Cheap		
				14 do.	Has been very cheap. Opisthotonic spasm just now.		
XLVIII. 14-7-94.	Antidotal experiment.	Cobra poison Liq. Strych. B. P.	m. i.	15 do.	Another spasm.	Do. do.	18 mins.
				20 do.	Has had 2 more spasms each following a disturbance.		
				25 do.	Dead.		
					Well at time of injection.		
XLVIII. 14-7-94.	Antidotal experiment.	Cobra poison Liq. Strych. B. P.	m. i.	7 mins.	Cheap	Do. do.	18 mins.
				9 do.	Opisthotonic convulsion.		
				11 do.	Very cheap.		
				14 do.	Slight spasm.		
XLVIII. 14-7-94.	Antidotal experiment.	Cobra poison Liq. Strych. B. P.	m. i.	18 do.	Dead.	Do. do.	18 mins.
					Well at time of injection.		
				7 mins.	Cheap		
				9 do.	Opisthotonic convulsion.		

*Experiments on the Antidotal action of Cobra Poison and Strychnine in Frogs (Sp. Rana Hexadactyla).
The large green tank frog of Madras).*

No of Experiment.	Character of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc observed.	Remarks.	Interval between 1st Injection and death.
XLIX. 14-7-94.	Control Strychnine experiment.	Liq Strych B. P. do	m $\frac{1}{2}$	22 mins.	No apparent effect.		Recovered.
L. 14-7-94.	Control Strychnine experiment.	Liq Strych B. P.	m i	51 do.	No apparent effect.		Recovered.
LI. 14-7-94.	Control Strychnine experiment.	Liq Strych B. P. do.	m $\frac{1}{2}$	55 mins.	No apparent effect.		Recovered.
LII. 14-7-94.	Control Strychnine experiment.	Liq Strych B. P. do.	m $\frac{1}{2}$	18 mins. 19 do.	No apparent effect. Tetanic spasm followed injection at once.	Comparatively a small animal.	
				32 do.	Looks very limp. Has spasms when moved.		
				50 do.	Very limp. Touching has very little effect now.		
				1 hr. 8 do. 2 do.	More lively. Recovered.		Recovered.
				9 mins. 19 do.	No apparent effect. Movements tetanic when animal is touched.		
				21 do. 43 do.	Marked spasms on being moved. Very limp.		
				1 hr. 30 do.	Seems to be slowly recovering.		Recovered.

LIII. 14-7-94.	Control cobra poison experiment.	Cobra poison (Fresh)	m $\frac{1}{2}$	21 mins. 32 do.	Well, quiet. Respiration 66 per minute. Jumping about, weak in hind legs. Getting weak. Respiration very shallow, 35 per minute.		
				37 do. 43 do.	Respiration not visible. Lying on back. Cannot recover position.		1 hr. 34 mins.
				1 hr. 34 do.	Dead. Died slowly.		
LIV. 14-7-94.	Control cobra poison experiment.	Cobra poison (Fresh)	m $\frac{1}{2}$	19 mins.	Well, quiet. Respiration 65 per minute. Getting weak. Respiration very shallow.		
				26 do.	Tried to jump out of bottle in which he had been placed.		
				31 do.	Getting weak. Respiration not visible.		
				38 do.	Lying on back. Can't recover position.		
				42 do.	Slight convulsions.		
				1 hr. 26 do.	Dead. Died slowly.		1 hr. 26 mins.
LV. 14-7-94.	Antidotal experiment.	Cobra poison Liq Strych B. P.	m $\frac{1}{2}$ m 1 $\frac{1}{2}$	11 mins. 23 do. 30 do. 43 do.	Well at time of 2nd injection. Slight spasms on stimulus. Opisthotonic convulsion. Dead.		43 mins.
LVI. 14-7-94.	Antidotal experiment.	Cobra poison Liq Strych B. P.	m $\frac{1}{2}$ m $\frac{1}{2}$	11 mins 21 do. 32 do. 51 do.	Severe convulsion. Slight stimuli produce convulsions. Tonic opisthotonus. Dead.		51 mins.

Experiments on Native Dogs. Average weight = 20 lb..

No. of Experiment.	Character of experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noticed.	Remarks.	Interval between 1st Injection and death.
LXVII. 17-7-94.	Control Strych. experiment on dog-bitch.	Liq. Strych. B. P.	m. i.	7 mins. 10 do 13 do 14 do 21 do 56 do 26 do 1 hr.	Tetani tremors when touched. Coat starting; walks 'on hot bricks,' jumpy. Opisthotonic convulsions; rigid. Opisthotonic convulsions very severe. Much better; jumps 'to touch,' but not to 'aural stimuli.' Jerking ceased even when touched. Sleepy; recovered to all intents.	Large dog.	Recovered.
LXVIII. 17-7-94.	Control Strych. experiment on bitch.	Liq. Strych. B. P.	m. iii.	3 mins. 6 do 15 do 17 do 18 do 20 do 24 do 29 do 34 do 39 do 57 do 39 do 1 hr. 2 hrs.	Looks excited already. Quiet; lying down; sleepy. Slight tremors if touched. Severe opisthotonic convulsion. Do do do Do do do Do do do Do do do Noisy laboured, respiration, 210 per minute. Sitting up; recovering; respiration 132. Lying down; sleepy; much better. Can be touched without producing spasm. Practically recovered.		Recovered.

A small dog, weight about 15 lbs.							
LIX. 17-7-94.	Control Strych. experiment on dog.	Liq. Strych. B. P.	m. ii.	4 mins. 7 do 8 do 9 do 10 do	Wagging tail vigorously; excited. Quieter; getting anxious; coat starting. Tetanioid twitching; 'on hot bricks.' Tonic opisthotonic rigidity the last 4 minute. Dead.		10 min.
LX. 17-7-94.	Control cobra poison experiment on bitch.	Cobra poison.	m. ii.	15 mins. 26 do 36 do 51 do 1 hr. 1 do 1 do 2 hrs. 3 do 4 do 5 do 6 do 6 do 21 do 26 do 7 do 7 do 36 do	Standing; looking ill; muzzle resting on ground. Looks very ill, stands; muzzle resting on ground and breathing with difficulty. Very ill; respiration 76, moving all facial muscles. Can stand; prefers to sit. Lying down, nose on ground. Sitting up; looks better. Lying on one side; respiration jerky 80. Standing up. Lying down; looks comfortable. More active; better. Seems practically recovered. Will not touch food; vomited frothy matter. Very ill; frothy secretion from mouth; walks about uneasily; lies down with muzzle on ground. Vomiting frothy stuff. Lying on one side; lower jaw beating against upper at each respiration. Tried to rise; fell on to side; hicough and vomiting. Found dead next morning.		Over. 7 hrs. 36 mins.

Experiments on Dogs—(continued).

No of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., observed.	Remarks.	Interval between 1st Injection and Death.
LXIV. 21-7-94.	Antidotal experiment on bitch.	Cobra poison. Liq. Strych. B. P.	m ii. m i. m i.	10 mins. 26 do 36 do 39 do 49 do 1 hr. 15 do 1 do 31 do 1 do 36 do 1 do 40 do 1 do 44 do 2 hrs. 14 do 2 do 17 do 2 do 30 do 2 do 48 do 3 do 5 do 3 do 14 do 3 do 23 do 3 do 50 do 3 do 51 do 3 do 55 do	Well. Lying down quietly. Quiet. Walking about as if on hot bricks. Jumpy. Twitching. Opisthotonus when touched. Breathing very fast. Better. Strychnisation passed off. Licking herself. Lying down flat. Looks ill. ... Jumpy if touched. Walking round. Strychnised. Evidence of strychnine has passed off. ... Well under strychnine. Strychnisation passing off. Very uneasy, tried to get up. Could not. Followed at once by Strych convulsion. Well under strychnine. Jumps on touch. ... Convulsions. Lies spread out. A touch produces a reflex and tremors of whole body. Slight convulsions. Dead.	Fairly large animal.	3 hrs. 55 mins.

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LXV. 21-7-94.	Control Strychnine experiment on goat. Sex not noted.	Liq. Strych. B. P.	m i.		At the time of injection animal was well. Looking about staring. Looking anxious, jumped twice. Opisthotonic convulsion. Do do. Do do (very severe). Seems to be recovering slowly, but there is still some Opisthotonus. Much better. Practically well. Recovered.	Recovered.
LXVI. 21-7-94.	Control Strychnine experiment on male goat.	Liq. Strych. B. P.	m i.	5 mins. 13 do 15 do 18 do 23 do 27 do 48 do 50 do	Well at time. Staring, uneasy. A twitch. Auditory stimuli produce 'jumps'. Twitching continuous. Slight opisthotonus when handled. Strychnisation passed off. Jumps to auditory stimuli. Strychnisation nearly passed off. Has been strychnized but effect has again passed off. Well under strychn. Convulsive tremors when touched. Opisthotonus. Jumps at any noise. Lying down quietly. Strych. passed off.	Seemed to excrete m.s. of strychnine very rapidly.
LXVII. 21-7-94.	Control cobra poison experiment on male goat.	Cobra poison.	m i	2 mins. 12 do 15 do 19 do	Well. Looks uneasy. Gets up and lies down again at short intervals. Looks ill. Does not care to stand. Better. Standing. Worse again. Uneasy.	Recovered.

Experiments on the Antidotal action of Cobra Poison and Strychnine in Goats (at $\frac{1}{2}$ years, Weight, 18 lbs.)

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No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Interval between 1st Injection and Death.
LXVII. 21-7-94.	Control cobra poison experiment on male goat. — (continued).	Cobra poison.		25 mins. 45 do 1 hr. 15 do 1 do. 23 do 1 do 25 do 1 do 27 do 1 do. 32 do 1 do. 35 do 1 do. 44 do	Better. Can stand when put on its legs. Prefers to lie down. Vomiting froth and green stained mucus. Lying down. Uneasy. Sick. Convulsions. Do. Attempted to rise but failed to do so. Gasping for breath. Repeated convulsion. Died.		1 hr. 44 mins.
LXVIII. 21-7-94.	Control cobra poison experiment on ewe goat.	Cobra poison.	m i	6 mins. 11 do 28 do 33 do 36 do 38 do 41 do 42 do	Very weak and ill. Can stand but soon falls. Better. Sitting quiet. Looks very ill. Worse. Standing up vomiting. Convulsions. Kicking all fours. No Opisthotonus. Convulsion of head and limbs. No Opisthotonus. Dead.		42 mins.

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LXIX. 21-7-94.	Control cobra poison experiment on ewe goat.	Cobra Poison.	m i. m i.	12 mins. 15 do 19 do 25 do 39 do 40 do 42 do 47 do	Well. Lying quiet. Weak in hind legs. Quiet. Can stand. Prefers lying down. Lying down. Moved and cried. Can't stand. Convulsion. Insensible. Dying. Another slight convulsion. Died.		47 mins.
LXX. 21-7-94.	Antidotal experiment on he-goat.	Cobra poison. Liq. Strychnine. B.P.	m i. m i.	16 mins. 21 do 22 do 33 do 35 do 37 do 38 do 40 do 40½ do	Well. Quiet. Under strychnine. Quiet if left alone. Responds to aural stimuli. Bad opisthotonic convulsion. Do. No reflexes to touch, seems dying. Convulsions followed injection at once. Dying. Effect of strychnine passing off. Dying. Dead.		40½ mins.
LXXI. 21-7-94.	Antidotal experiment on ewe-goat.	Cobra poison. Liq. Strychnine. R.P. Do Do	m i. m i. m i. m i.	23 mins. 41 do 58 do 1 hr. 4 do 1 do. 7 do 1 do. 10 do 1 do. 12 do	Well. Asleep. Lying quiet. Uneasy. Standing up. Very cheap indeed. Vomiting green fluid, Dying of cobra poison. (i.e. Lying flat, nose down, limbs spread, etc.) Convulsions. Dead.		1 hr. 12 mins.

Experiments on the Antidotal action of Cobra Poison and Strychnine in Pigs, on 4th August 1894.

No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
LXXII.	Control Strychnine experiment.	Liq. Strych. B. P.	m ii.	5 mins. 10 do. 13 do.	Well at the time. Respiration 39; excitable. Beginning to look about her. A wisp of grass fell on her; she started violently; struggled to get free; rose to her feet; seemed 'on hot bricks'; sat down at once. Has been standing for several minutes; has just sat down; respiration 30; starts at a sound. Springs violently when touched. Lying on her belly; a convulsion; another violent convulsion. Still starts violently when touched by a straw. Recovered.	Sow, weight 25 lbs.	
LXXIII.	Control Strychnine experiment.	Liq. Strych. B. P.	m v.	5 mins. 8 do. 10 do. 12 do.	Well at time. Beginning to breathe fast; stands as if on hot bricks; starts at least sounds. Violent opisthotonic convulsion; first clonic and then tonic. Two more similar convulsions, severe. Dead.	Pig, weight 20 lbs.	12 min.

LXXIV.	Control Strychnine experiment.	Liq. Strych. B. P.	m v.	13 mins. 20 do. 45 do.	Respiration 72. Touched with a straw; started violently. Breathing fast and with effort, violent start when touched. Strychnisation nearly passed off; respiration rapid. Lying on belly; limbs stretched. Starts violently when touched. As before; respiration 140. Violent start when touched. Recovered.	Sow, weight 50 lbs.	Recovered.
LXXV.	Control Strychnine experiment.	Liq. Strych. B. P.	m vii.	10 mins. 15 do. 22 do. 24 do. 25 do.	Rose; as if "on hot bricks"; convulsion. Respiration rapid; opisthotonic convulsion tonic and clonic; another convulsion. Severe opisthotonic convulsion. Unurinated. Dead.	Sow, weight 35 lbs.	25 mins.
LXXVI.	Control cobra poison experiment.	Cobra poison.	m ii.	20 mins. 1 hr. 40 do. 3 hrs. 50 do. 4 do. 25 do. 4 do. 45 do. 5 do. 12 do. 5 do. 27 do. 5 do. 40 do. 5 do. 50 do.	Well. Standing, muzzle low. Lying down, very sluggish. Has been alternately lying and standing; seems very cheap; slight convulsion. Unable to stand. Very sluggish. Respiration 30, shallow; nose livid; all but dead. R. 26; a catch in the middle of each inspiration; heart forcible. Slight convulsion. Dead.	Weight 22 lbs.	5 hrs. 50 mins.

Experiments on the Antidotal action of Cobra Poison and Strychnine in Pigs, on 4th August, 1894. — (continued.)

No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Interval between 1st Injection and Death.
LXXVII.	Control cobra experiment.	Cobra poison.	m. iv.	1 hr. 0 mins. 3 hrs. 13 do 3 do 28 do 4 do 38 do 5 hrs. 18 mins. 9 do 38 do 12 do 45 do	Well. Standing with muzzle lowered. Got up and moved when disturbed, but has lain down the last 1½ hour. Got up, fell. Slight convulsion. Is roused with difficulty. Still strong when roused. Lying down. Won't rise even when poked. Does not eat. Still alive, lying on one side. Cannot rise, has not eaten. Has vomited. Has been retching at intervals saliva and froth freely escaping from mouth. Heard struggling (at 2 A.M.). Butler went in and saw it die, apparently convulsions preceded death.	Pig, weight 46 lbs.	12 hrs. 45 mins.

LXXVIII.	Antidotal Experiment.	Cobra poison. Liq. Strych. B.P.	m. ii. m. iii.	1 hr. 5 mins 1 do 12 do 1 do 17 do	Well. Cheap, drowsy. Opisthotonic convulsion. Squealed loudly. Opisthotonic convulsion severe, clonic and tonic. Respiration 30.	Pig, weight 19½ lbs.	
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LXXIX.	Antidotal experiment.	Cobra poison. Liq. Strych. B.P.	m. iv. m. iv.	25 mins. 1 hr. 14 do 1 do 23 do 1 do 40 do 1 do 52 do 2 hrs. 10 do 2 do 15 do 2 do 25 do 2 do 28 do	Convulsion following aural stimulation. 1 do 19 do 1 do 22 do 1 do 27 do 1 do 32 do 2 hrs. 5 do 2 do 35 do 2 do 40 do 2 do 50 do 2 do 55 do 3 do 3 do 3 do 12 do 3 do 18 do 3 do 17 do 3 do 18 do 3 do 19 do 25 mins. 1 hr. 14 do 1 do 23 do 1 do 40 do 1 do 52 do 2 hrs. 10 do 2 do 15 do 2 do 25 do 2 do 28 do	Well. Standing with muzzle lowered. Starts at least sound. Very uneasy and easily startled. Very easily startled. Opisthotonic convulsions since last note. Slight convulsion. Convulsion when startled.	3 hrs. 19 mins.
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Experiments on the Antidotal action of Strychnia in Cobra poisoned Monkeys. (Macacus Radiatus).

No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
LXXIX.	Antidotal experiment.	Liq. Strych. B.P.	m ii.	2 hrs. 50 mins	Slight convulsion of jaw and limb at the time. Probably due to cobra poison.		
		Liq. Strych. B.P.	m v.	2 do 52 do 2 do 55 do 2 do 56 do	Lying on side, cannot be roused. Twitchings becoming more marked. Dead.		2 hrs. 56 mins.
LXXX.	Strychnine Control Experiment.	Liq. Strych. B. P.	m $\frac{1}{2}$	7 mins 10 do 12 do 17 do	Well at time. Opisthotonus with screaming. Opisthotonus thrice repeated.	Male. Weight = 1 $\frac{1}{2}$ lbs.	
		Liq. Strych. B. P. (a large minim).	m $\frac{1}{2}$	18 do 37 do 44 do 1 hr. 0 do 1 do 2 do 1 do 6 do	Recovering rapidly. No response to noise. Sleepy. Slight convulsion when touched. Respiration 64. No do do. Well. Sitting up. Resp. 40. Quiet. Opisthotonus. Repeated opisthotonus since last note.		
		Liq. Strych. B. P.	m $\frac{1}{2}$	1 do 22 do 1 do 57 do 2 hrs. 8 do 2 do 16 do 3 do 2 do	Opisthotonus. Still under strychnine Strychnine passed off. Opisthotonus. Repeated convulsion since last note. Spontaneous at first, only produced 'on touch' latterly.		

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Total time = 3 hrs. 45 mins.

Strychnine pushed to ascertain lethal dose.

Time between 4th and 7th injection = 34 mins.

3 do	7 do	No convulsion when touched. the
3 do	14 do	Slightly under strychnine at time.
3 do	22 do	Severe opisthotonus.
3 do	28 do	After severe convulsion, is nearly dead.
3 do	34 do	Nearly dead. Quiet.
3 do	39 do	Dead.
3 do	45 do	
3 do	48 do	

Female. Weight 4 lbs. 1 oz.

Strychnine Control Experiment.

LXXXI.
15-8-94.

Do	Do	Liq. Strych. B. P.	m ii	7 mins 8 do 10 do 11 do 15 do 19 do 25 do	Well at time. Passed a motion. Vomited. Repeated emprothotonus. Convulsion. Lying on belly. Opisthotonus. Resp. 112. Rigid. Repeated opisthotonus since last note. Croaking occasionally. Lying on side. Res. 120. Croaks occasionally. Starts at a sound or touch.
Do	Do	Do	m i	45 do 1 hr. 0 do 1 do 11 do 1 do 22 do 1 do 32 do	Better. Respiration 160. Sitting up. Looks tired and ill. Emprothotonus. Repeated emprothotonus since last note. Tetanic twitches at intervals.
Do	Do	Do	m $\frac{1}{2}$	1 do 51 do 1 do 55 do 2 hrs. 20 do 2 do 27 do 2 do 32 do	Starts at least sound. Res. 92. Does not notice noises now. Better. Staring. Jumpy. Convulsions but no opisthotonus.

37

38

39

1 hr. 25 mins.

Experiments on Monkeys—(continued.)

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No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
LXXXIV. —continued.	Control Cobra Experiment.	Cobra Poison.		2 hrs. 30 mins. 2 do. 32 do. 2 do. 42 do.	Very drunk; can't sit up long. Sitting up; eyes shut; looks ill. Very sleepy; movements inco-ordinate; can't sit up easily; seems comfortable when lying on her back.		
				2 hrs. 52 do. 3 do. 5 do. 3 do. 15 do.	Vomited; drunk; drowsy. Very drunk. Sitting; head lowered on chest; very quiet; very cheap; can't stand or sit; falls like a sack when lifted.		
				3 do. 50 do. 4 do. 10 do. 4 do. 15 do.	Convulsive movements of limbs. Convulsive movements of limbs. Convulsive movements of limbs.		
				4 do. 33 do. 4 do. 34 do.	Dead.		
LXXXV. 16-8-94.	Control cobra experiment.	Cobra poison.	m. ii.	11 mins. 17 do. 1 hr. 10 do.	Well. Quiet. Lying down quiet. Moving slowly about; face very dusky.	Male, weight 3 lb. 3 oz.	4 hrs. 34 mins.
				1 do 29 do 2 hrs. 0 do 2 do 24 do 2 do 30 do	Eyelids drooping. Colour dusky; can stand; eyes shut. Very cheap. limbs; sits up for a few seconds at a time, and then head falls on chest, and he rolls over to one side.		

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LXXXVI. 16-8-94.	Control Cobra Experiment.	Cobra Poison.	m. ii.	2 do 35 do 2 do 36 do	Lies down drowsy. Uncasy; rolling about; looks as if drunk and in pain, seems to see a vision of a rope, etc., rises on his hind legs to reach it, looking up eagerly.		3 hrs. 0 mins.
				2 do 45 do 2 do 50 do 3 do 0 do 3 do 3 do	Drunk and incapable; rolling about. Convulsions. Lead. Chest opened; heart beating 80 to minute.		
				31 mins. 33 do 53 do	Very strong and active. Well. Respiration 48, seems fairly well. Getting dusky in face, very quiet. Eyelids drooping, seems as if drunk.	Female, weight 8½ lbs (8 lbs. 4 oz.)	
				1 hr. 0 do 1 do 8 do 2 hrs. 5 do 2 do 15 do 2 do 20 do 2 do 24 do 3 do 8 do 4 do 13 do 4 do 30 do	Seems better. Very drowsy. A tremor passed over her. Sits very quiet; head drooping. Cannot rise; falls flop. Seems to be dying; still breathing. Lead.		4 hrs. 30 mins.
LXXXVII. 16-8-94.	Antidotal Experiment.	Cobra Poison. Liq. Strych. B.P.	m. i. m. ½.	27 mins. 29 do 30 do 33 do 35 do	Well. Drowsy; eyelids falling. More lively since injection. Anxious, excited, looks old. Opisthotonic quiver; tail rigid, seizes objects on the floor to try and steady himself.	Weight 2 lbs. ½ oz.	

Experiments on Monkeys—(continued).

No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st injection and Death.
LXXXVII. 16-8-94.	Antidotal Experiment.	Liq. Strych. B. P.		36 mins. 38 do 41 do 43 do 57 do	Strong opisthotonus. Lying on one side; very cheap. Opisthotonic twitching. Occasional twitches. Twitching at intervals and one slight convulsion since last note. Takes more interest in life, but does not twitch when touched; seem, very limp; took no notice of injection.		
		Do do	m t.	1 hr. 7 do 1 do 27 do	Twitches when touched. Does not twitch when touched; seem, very limp; took no notice of injection.		
				1 do 31 do 1 do 33 do 1 do 42 do	Twitches at intervals; seems very ill and weak.		
				1 do 52 do	Twitches still; face drawn; has not woke up at all.		
		Do do	m t.	1 do 57 do 2 hrs. 0 do	Slight tremor. Appears dying; still twitching.		
				2 do 5 do	No reflexes; dead.		2 hrs. 5 mins.
LXXXVIII. 16-8-94.	Antidotal experiment.	Cobra poison.	m i.	57 mins.	Well.	Male. Weight, 3 lbs. 8 oz.	
		Liq. Strych. B. P.	m t.	1 hr. 1 do	Looking old and dusky the last hour. Eyelids drooping now.		

				1 do 7 do 1 do 10 do 1 do 17 do 1 do 29 do	Vomited. No increased reflex- citability. Twitches violently when touched. Vomited. Eyelids drooping. No Drowsy. Twitches on touch.		
		Do do	m t.	1 do 34 do 1 do 37 do 1 do 42 do 1 do 49 do 1 do 54 do	Vomited. Twitches when touched. Vomited, twitches when touched. Jumping spontaneously. Has vomited, defecated and urinated at intervals. Lies about a good deal.		
				2 hrs. 7 do	Getting very drunk. Restless. Starts on touch. Movements in-co-ordinate.		
		Do do	m t.	2 do 29 do 2 do 33 do	Very cheap. Head on ground. Twitches at a touch.		
		Do do	m t.	3 do 12 do 3 do 22 do 3 do 47 do 3 do 57 do 4 do 5 do 4 do 7 do	As in last note. Strychnisation passing off. Seems dying. Twitches at a touch. To do do. Lying on one side. Moves uneasily. Dead. Had tremor when touched up till just before death.		4 hrs. 7 mins.
LXXXIX.	Antidotal Experiment.	Cobra poison.	m i.	31 mins. 53 do 59 do 1 hr. 0 do 1 do 4 do 1 do 9 do	Well. Sits very quiet. Nothing to note. Shows signs of strychnia poisoning. Lids beginning to droop. Lying on his side very quiet.	Male. Weight, 3 lbs. 11 oz.	

Experiments on Monkeys—(continued.)

No of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
LXXXIX. <i>continued.</i>	Antidotal Experiment.	Liq. Strych. B. P.		1 hr. 14 mins	Very quiet but jumpy when touched. Sitting up. Fairly well.		
		Do	m $\frac{1}{2}$.	1 do 16 do	Sitting up; fairly well.		
				1 do 26 do	Looks decidedly drunk.		
				1 do 29 do	Does not jump when touched.		
				1 do 37 do	Looks very cheap. Head drooping.		
				1 do 38 do	Slightly under strychnine.		
				1 do 40 do	Well under strychnine.		
				1 do 41 do	Strong tetanic spasm. Lying on his side.		
				1 do 52 do	Occasional strong spasms. Quiet in intervals		
				2 hrs. 12 do	Starts when touched.		
				2 do 21 do	Scarcely responds to stimuli; on touching corner a Rieus Sardonicus is noticed. Seems nearly dead.		
				2 do 25 do	Dead.		2 hrs. 25 mins.
XC. 25-5-94.	Antidotal Experiment.	Cobra Poison	m ii.	32 min. 37 do.	Well. Upper eyelids drooping a little. Marked drooping of lids. Patch of blue discolouration well marked at seat of injection.	Male. weight, 3 lb. 5 oz.	
		Liq strychn. B. P.	m $\frac{1}{2}$.	44 do. 46 do. 48 do.	Tumbles about as if drunk. Tumbles over as if dead drunk. Occasionally shows slight strychnine twitches.		

				52 do. 54 do.	Distinct twitchings. Lies over on his side. Very quiet. Now and then twitches spontaneously.		
				59 do.	Very strong strychnine spasm, after which he lay as if moribund.		
		Do. do.	m i.	1 hr. 1 do. 1 do 3 do.	Has had 2 or 3 twitches since last injection. Fying.		1 hr. 5 mins.
		Do. do.	m i.	1 do 4 do. 1 do 5 do.	Dead.		
XCI. 16-8-94.	Antidotal experiment.	Cobra poison.	m ii.	15 mins 16 do	Well. Bad colour. Restless.	Female. Weight, 8 lbs.	
		Liq. Strych. B. P.	m $\frac{1}{2}$	27 do 32 do 35 do	Slight symptoms of strychnine. Jerks to auditory stimuli. Tried to rise. Tetanic condition of legs.		
		Do	m $\frac{1}{2}$	41 do 56 do	As before. Respiration 72. Strychnine nearly passed off. Lying down.		
		Do	m $\frac{1}{2}$	1 hr. 0 do 1 do 3 do 1 do 4 do 1 do 26 do	Emprosthotonus threatening. Jerks on touch. Slight opisthotonus. Strychnisation passing off.		
		Do	m $\frac{1}{2}$	2 hrs. 8 do 2 do 45 do 2 do 53 do	Twitches when touched. Strychnisation passed off. Looks much better.		
		Do	m $\frac{1}{2}$	3 do 15 do 3 do 31 do 3 do 36 do 3 do 51 do 3 do 52 do 4 do 11 do	Cheap. Well strychninised. Drooping lids. Very weak. Fallen down. Not strychninised. Still under strychnine from last injection.		

Experiments on Monkeys—(continued).

No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
		Liq. Strych. B. P.	m i	4 hrs. 26 mins 4 do 28 do	Seemed dying. Strychnine given. A slight convulsion.		
		Do do		4 do 29 do	Seems dying. Still twitches to touch.		
				4 do 31 do	Convulsion.		
				4 do 35 do	Starts on touch.		
				4 do 41 do	Convulsion.		
				4 do 51 do	Still starts to touch.		
				5 do 1 do	Do do do		
				5 do 11 do	Quite helpless.		
				5 do 16 do	Dying.		
				5 do 17 do			
				5 do 18 do	Starts at a sound, but is blue in the face and seems dying.		
				5 do 21 do	Still responds to a touch by jerking but in a half dead kind of way.		
				5 do 34 do	Practically dead. No response to any stimulus, except that there is some corneal reflex.		
		Do do	m i	5 do 37 do	Struggling feebly. Corneal reflex present.		
				5 do 40 do	Cobra convulsion. Dead.		5 hrs. 40 mins.

XCII.
16-S-94.Antidotal experiment.
Cobra poison.

m iv.

Excited after injection. Scratching the spot. Eyelids drooping. Looks old. Site of experiment suggested by Surg. Major Maitland. I.M.S.

18 mins.

Very drunk.

Fell on his side

Slight convulsion.

Powerless.

Seemed dead.

Corneal reflex present.

Slight twitching.

Woke a little.

Twitches at a sound.

Strychnine convulsion abortive.

Twitching constantly.

No response to stimuli.

No respiratory movement.

Heart beating actively.

Slight twitching of hands.

No corneal reflex.

Dead.

36 mins.

XCIII.
25-S-94.

Antidotal Experiment suggested by Brig. Surg. Lt. Col. Price.

Cobra poison.

m vi.

18 mins.

Eyelids beginning to droop; very quiet.

Eyelids very droopy; getting slack.

Convulsions ushered in by shivers.

Tail rigid.

Breathing very rapid; Emprosthotonic convulsion.

Dying.

Dead.

Male weight 3 lbs. 14 oz.

N.B.—The severity of the convulsion seemed modified by the Cobra poison, but death was clearly due to the strychnine.

33 min. 5 min. after injection of strychnine.

Experiments on Monkeys—(concluded.)

No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
XCIV. 25-8-94.	Control Strych Experiment on XCIII also Suggested by Brig.-Surg.-Lt.-Col. Price.	Liq. Strych. B. P.	m vi.	3 mins.	Opisthotonic convulsions, commenced.	Not weighed but was about same size as monkey in last experiment.	
				9 do	Convulsions have continued since last note, at first very violent, now less so.		
				11 do	The animal is now rigid. Very bad colour; severe emprosthotonic convulsions.		
				14 do 49 do	Getting better; fits less violent. Very ill; convulsions still continue seems about to die. He was left and an hour later was found dead.		
XCV. 16-8-94.	Antidotal Experiment suggested by Brig.-Surg.-Lt.-Col. Price.	Cobra Poison Liq. Strych. B. P.	m vi. m vi.	21 mins.	Lies down, looks cheap; struggles strongly if interfered with.	Male Weight 3lb. 10½ oz.	Probably about 1 hour.
				23 do	Injected by mistake into the swelling caused by the cobra injection.		
				29 do 37 do	Standing up; looks stiff. Sits quietly; eyelids drooping; when made to move his movements are stiff;		
				40 do	Jumpy.		

XCVI. 16-8-94.	Antidotal Experiment suggested by Surg.-Lt.-Col. Browne.	Liq. Strych. B. P.	m v. m v.	44 do	A convulsive fit; lying on his side.	The 1st injection being into the seat of the wound caused by the cobra poison was apparently not absorbed. Death speedily followed the 2nd injection which was made on a fresh surface.	56 mins.
				47 do	Tries to lift his head; each effort brings on a fit.		
				51 do	Lying on side; eyes closed; gets fits when touched.		
				52 do	Injection followed almost at once by constant fits. Perfectly rigid.		
				55 do	Convulsions continue, but he is less rigid.		
				56 do	Dead.		
				...	Poisons injected practically simultaneously.		
				4 mins.	Uneasy; staring; looks odd.		
				5 do	Looks very anxious.		
				8 do	Slight spasm; opisthotonic convulsion.		
				13 do	Severe opisthotonic convulsion.		
				18 do	Lying quiet; has occasional spasms.		
				21 do	Eyelids drooping; is fully under strychnine.		
				33 do	Severe opisthotonic convulsion.		
				41 do	Twitches when touched.		
				45 do	Twitches when touched.		
				54 do	Twitches when touched; a convulsion of arms and legs.		
				58 do	Still twitches when touched.		
				1 hr. 0 do	Dead.		

Experiments on Dogs.—(Additional).

No. of Experiment.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Interval between 1st Injection and Death.
XCVII. 25-8-94.	Control Strychnine experiment.	Liq. Strych B. P.	m vi.	4 mins.	Well.	Bitch, weight 21lbs Two experiments eng- rested by Brig-Surg. Lt. Col. Price to demonstrate that strychnine would kill an animal already heavily under poison. Bitch Weight 22 lbs. Died 18 minutes after 1st dose of strychnine.	31 mins.
				5 do.	'Oa hot bricks.' Strong tetanic spasms at once followed by Respiration on 72; lying on side; urinated.		
				8 do.	Respiration 168; powerful opisthotonus; risus sardonicus.		
				12 do.	Lies on side breathing very rapidly.		
				17 do.	Marked spasm.		
				26 do.	Spasms.		
				28 do.	Dead.		
				31 do.			
				17 mins.	Stands up; very quiet.		
				19 do.	Sitting down, head drooping.		
XCVIII. 25-8-94.	Antidotal experiment.	Cobra poison	m vi.	21 do.	Lying down; looks sleepy.	Bitch Weight 22 lbs. Died 18 minutes after 1st dose of strychnine.	39 mins.
				24 do.	Breathing very quiet.		
				28 do.	Slight spasm.		
				29½ do.	Marked spasm.		
				31 do.	Very cheap but twitch when touched.		
				33 do.			
				35 do.	Slight spasms.		
				36 do.	Lies as if nearly dead.		
				38 do.			
				39 do.	Dead.		

APPENDIX II.

A list of control Cobra poison and Antidotal experiments on Animals to show the relative duration of life with and without Strychnine.

No. of Experiment.	Character of Experiment.	Nature of Injection.	Dose.	Interval between 1st injection and death.	Remarks.
1	Control Cobra on Guinea-pig	Cobra poison	m i.	53 mins.	A large Guinea pig. Size probably influenced the time.
5	Do	Do	m ss.	43 mins.	
7	Do	Do	m i.	36 mins.	
9	Do	Do	m i.	40 mins.	
6	Antidotal Experiment on Guinea-pig	{ Cobra poison Liq. Strych.	{ m ss. m i.	38 mins.	
8	Do	{ Cobra poison Liq. Strych.	{ m i. m i.	41 mins.	
11	Do	{ Cobra poison Liq. Strych.	{ m i. m i.	40 mins.	
12	Do	{ Cobra poison Liq. Strych.	{ m i. m i.	70 mins.	
13	Control Cobra on Hare	Cobra poison	m i.	1 hr. 25 mins.	
14	Do	Do	m i.	1 hr. 27 mins.	
18	Antidotal Experiment on Hare.	{ Cobra poison Liq. Strych.	{ m ss. m i.	1 hr. 43 mins.	A small hen. A large strong cock.
19	Do	{ Cobra poison Liq. Strych.	{ m i. m i.	1 hr. 35 mins.	
24	Control Cobra on Fowl	Cobra poison	m i.	4 hrs. + 30 mins.	
25	Do	Do	m ii.	2 hrs. 15 mins.	
26	Do	Do	m ii.	...	
27	Antidotal Experiment on Fowl	{ Cobra poison Liq. Strych.	{ m ii. m iii.	1 hr. 13 mins.	
28	Do	{ Cobra poison Liq. Strych.	{ m ii. m i.	1 hr. 20 mins.	
29	Do	{ Cobra poison Liq. Strych.	{ m i. m iii.	1 hr. 7 mins.	
34	Cobra poison on Duck.	Cobra poison	m i.	1 hr. 32 mins.	
35	Do	Do	m i.	41 mins.	
36	Do	Do	m ii.	23 mins.	A small hen. A large strong cock.
37	Antidotal Experiment on Duck.	{ Cobra poison Liq. Strych.	{ m ii. m i.	32 mins.	
38	Do	{ Cobra poison Liq. Strych.	{ m i. m ii.	1 hr. 2 mins.	
39	Do	{ Cobra poison Liq. Strych.	{ m ii. m i.	1 hr. 18 mins.	
43	Control Cobra on Blood-sucker.	Cobra poison	m i.	16 mins.	
44	Do	do	m i.	15 mins.	
45	Do	do	m ss.	20 mins.	
46	Do	do	m ss.	44 mins.	
47	Antidotal Experiment on Bloodsucker	{ Cobra poison Liq. Strych.	{ m ss. m ss.	25 mins.	
48	Do	{ Cobra poison Liq. Strych.	{ m ss. m ss.	18 mins.	
53	Control Cobra on Frog	Cobra poison	m ss.	1 hr. 34 mins.	
54	Do	do	m ss.	1 hr. 26 mins.	
55	Antidotal on Frog.	{ Cobra poison Liq. Strych.	{ m ss. m i.	43 mins.	
56	Do	{ Cobra poison Liq. Strych.	{ m ss. m ss.	51 mins.	

A list of control Cobra poison and Antidotal experiments on Animals, &c.

Appendix III.
An Analysis of Appendix II to show the relative duration of life in Cobra-poisoned animals with and without Strychnine

without strychnine

N.B.—The original order of the experiment is maintained.					
Animals experimented on.	No. of animals from which average is drawn	Dose of Cobra poison.	Average duration of life without Strychnine.	Average duration of life with Strychnine.	Remarks.
	Column A.	Column B.			
Guinea pigs	1	1	43 min.	38 min.	
do.	3	3	43 do.	50½ do.	
Hares	2	2	1 hr. 26 do.	1 hr. 38½ do.	
Fowls	1	1	4 hrs.	1 do. 7 do.	Difference practically negligible.
do.	2	2	1 hr. 22½ do.	1 do. 16½ do.	
Ducks	2	2	1 do. 6¼ do.	1 do. 7¾ do.	
do.	1	1	32 do.	32 do.	
Bloodsuckers	2	2	30 do.	21½ do.	Against Strychnine.
Frogs	2	2	1 do. 13 do.	47 do.	do.
Goats	2	2	7 hrs. 36 do.	58 do.	do.
Dogs	1	1	5 do. 30 do.	3 hrs. 55 do.	do.
do.	1	1	5 do. 50 do.	2 do. 9 do.	do.
Pigs	1	1	12 do. 45 do.	3 do. 19 do.	do.
do.	1	1	2 do. 41 do.	2 do. 56 do.	do.
Monkeys	3	3	3 do. 45 do.	2 do. 52 do.	} No apparent difference.
do.	2	2		3 do. 22½ do.	

Appendix IV.

An Analysis of the Recorded cases in which Strychnine has been used as an Antidote for Snake-bite.

No. of Cases.	Reported		Identification of the Snake.	Local signs.	Symptoms.			Interval between		Result.	Treatment		REMARKS.
	By	In			Refferible to Snake bite.	Refferible to Strychnisation.	Refferible to other causes.	(A) Bite and commencement of Strychnine treatment.	(B) Time and recovery or death.		By Strychnine.	By other means.	
1	Surg.-Capt. H. Smith for Asst. Surg. Law.	I. M. G., December 1893.	Not identified ...	Swelling and burning heat in the foot. Bitten on toe.	Drowsiness. Drooping eyelids. Retention of consciousness to the last. Vomiting.	Twitchings of face forearm and hand. Vomiting.	Nil.	6 hours ... (no symptoms before this).	2 1/2 hrs.	Death.	1 1/2 grain in 16 hours.	Incision and rubbing in of permanganate of potash.	(1) Strychnine does not appear to have had any distinct influence. (2) Strychnisation was produced. A male adult.
2	Surg.-Capt. J. Pratt, I.M.S.	I. M. G., August 1894.	Not identified ...	Great pain at seat of bite, viz., Inner side of left arm near fold of axilla. 2 punctures, 1/2 inch apart.	Drowsiness. Loss of power in legs. Skin surface cold and clammy. Pulse Feeble. R. Slow and sobbing. Profuse salivation. Collapse. Insensibility.	None.	None.	1 hr. 45 min. (as soon as seen).	2 hrs. 45 mins.	Death.	More than 1/2 grain in 1 hour.	?	Female at 25 years.
3	Hospital Assistant B. P. Misra.	The Medical Reporter, 16th August 1894.	Not identified ...	3 punctures on thumb. 1 bleeding and situated over the Digital vein.	Head ache Sense of heat? Other symptoms not specified. Unconsciousness supervened.	...	...	About 2 hrs. +.	4 hrs. +	Death.	1 1/2 grain in 2 hours.	?	Female at 35 years.
4	Hospital Assistant B. P. Misra.	The Medical Reporter, 16th August 1894.	Not identified ...	2 punctures on thumb, bleeding.	Drowsiness ...	...	Drowsiness. Dilated pupils. Irregular and sighing respiration. Feeble slow pulse.	?	2 days.	Recovered.	1.9 gr. in 5 1/2 hrs.	Ligature above bite.	* ? Due to fright Female at 35 years.
5	Hospital Assistant B. P. Misra.	The Medical Reporter, 16th August 1894.	Not identified ...	?	No symptom described.	...	...	2 hr. +	?	Recovered.	.6 gr.	?	Female at 23 years.
6	Hospital Assistant B. P. Misra.	The Medical Reporter, 16th Aug. 1894.	Not identified.	2 punctures on index finger.	None.	None.	Drowsy. Sensation of heat. Unconsciousness.	2 hrs.	7 hrs.	Recovered.	.8 of a grain in 6 hrs.	Free incision Liq. Ammon.	Female at 45 years.

An Analysis of the Recorded cases in which Strychnine has been used as an Antidote for Snake-bite—(continued).

No. of Case.	Reported		Identification of the Snake.	Local signs.	Symptoms.			Interval between.		Result.	Treatment		REMARKS.
	By	In			Refferible to Snake-bite.	Reffer ble to Strychnisation.	Refferible to other causes.	(A) Bite and commencement of Strychnia treatment	(B) Bite and Recovery or death.		By Strychnine.	By other means.	
7	Hospital Assis ant B. P. Misra.	The Medical Reporter, August 16th, 1894 and Oct. 16th, 1894.	Not identified.	None recorded.	Symptoms not marked on admission but rapidly super vened.	None recorded.	None recorded.	Not stated.	2 hours*	Death.	½ grain.	Not stated.	Adult æt. 22. The recorder notes that in cases 7—10, the patients came in without symptoms. Symptoms came on later and paralysis of speech and nasal voice were then noticed.
8	Hospital Assistant B. P. Misra.	The Medical R porter, August 16th, 1894 and Oct. 16th, 1894.	Not identified.	Numerous marks of bites.	No record.	None recorded.	None recorded.	Not stated.	Not stated.	Death.	Not stated.	Not stated.	
9	Hospital Assistant B. P. Misra.	The Medical Reporter, August 16th, 1894 and Oct. 16th, 1894.	Not identified.	None recorded.	"In an advanced stage of snake poisoning."	None recorded.	None recorded.	Not stated.	Not stated.	Death.	8 grain.	Not stated.	
10	Hospital Assistant B. P. Misra.	The Medical Reporter, August 16th, 1894 and Oct. 16th, 1894.	Not identified.	Marks of bites seen.		None recorded.	None recorded.	Not stated.	2 hours.	Death.	"Injected steadily."	Wound inci sed.	
11-16	Hospital Assistant B. P. Misra.	The Medical Reporter, August 16th, 1894 and Oct. 16th, 1894.	Not identified.	Not stated.	No record.	None recorded.	None recorded.	Not stated.	No record.	Reco very in all.	Doses not given.	Not stated.	These cases are alluded to as recoveries but no notes are given and in the majority at least there was no paralysis of speech. Further these patients all came in with some symptoms, possibly those of fright.

An Analysis of the Recorded cases in which Strychnine has been used as an Antidote for Snake-bite.—(continued.)

No. of Cases.	Reported		Identification of the Snake.	Local signs.	Symptoms.			Interval between.		Result.	Treatment		REMARKS.
	By	In			Refferible to Snake-bite.	Refferible to Strychnisation.	Refferible to other causes.	(A) Bite and commencement of Strychnia treatment.	(B) Bite and Recovery or death.		By Strychnine.	By other means.	
17-21	Asst. Surg. E. A. Thomas	I.M. Record, 1st Dec. 1892.	Not identified in any of the 5 cases.	2 fang marks in all cases.	None cited.	None cited.	Drows'ness and giddiness in 3 cases.	Case I, 1 hr.	3 hrs.	Recovered.	45 grains in 2 hrs.	2 ligatures.	(a) No symptoms of snake poison.
								Case II, ½ hr.	2½ hrs.	Recovered.	15 grains in 2 hrs.	?	(b) The presence of punctures is not an undoubted sign of a poisonous-snake-bite.
								Case III, at once.	?	Recovered.	?	Ligatures.	(c) Strychnia by mouth and in small doses.
								Case IV ?	?	Recovered.	?	Ligatures.	(d) Recovery too rapid for true snake poisoning.
								Case V, ¼ hr.	2½ hrs.	Recovered.	3 of a grain.	?	(e) Clinical notes very scanty.
22	Asst. Surg. H. D. Pant.	I. M. Record, 1st Dec. 1892.	Snake not even seen.	3 punctures on palmar aspect of last phalanx of index finger of right hand. Pain in hand.	None.	None.	Teeth chattering. Hands and feet cold. Slightly livid. Pupils dilated. Conscious. Much frightened.	1 hour.	7½ hrs.	Recovered.	1½ gr. in one dose subcutaneously.	Quinine gr. ii. Ammon Carb gr. x Brandy 1 oz.	A boy æt 10 years.
23	Mazhair Hussain, Civil Surgeon, Aurungabad.	I. M. Record, 1st June 1894.	Not identified.	Bite on dorsum of 1st metatarsal bone.	Giddiness. Insensibility. Salivation.	None recorded.	Re-appearance of symptoms on 2nd 3rd and 4th days.	7 hrs.	7 days. Critical symptoms for 3 days.	Recovered.	½ gr. in ¼ hr. on first day. 4 gr. in 10 m. on 3rd day. 6 grs. in 3½ hrs. later on 3rd day, etc.	...	Female æt 22 years. Earlier symptoms probably due to slight case of cobra-bite. Later symptoms ? ? ? due to native drugs ?
24	A. J. Weatherly, M. D., Civil Medical Officer, Kurseong.	I. M. G., June 1894.	Not identified.	None recorded. Bitten on finger.	None.	None.	Insensibility Shallow respiration. Cold skin. Pulse feeble and irregular. No conjunctival reflex.	1 hour.	Practically recovered in 2 hrs.	Recovery.	1½ gr. subcutaneously at once.	Liq. Ammonia. Ligature. Free incision and Condy's fluid locally rubbed in.	Male æt 45. Fear will account for all the symptoms and for the rapid recovery.

An Analysis of the Recorded cases in which Strychnine has been used as an Antidote for Snake-bite.—(continued).

No. of cases.	Reported		Identification of the Snake.	Local signs.	Symptoms.			Interval between		Result.	Treatment		REMARKS.
	By	In			Referrable to Snake-bite.	Referrable to Strychnisation.	Referrable to other Causes.	(A) Bite and commencement of Strychnia treatment.	(B) Bite and Recovery or death.		By Strychnine.	By other means.	
25	Surgeon-Captain J. Vaughan, I. M. S.	I. M. G., Aug. 1893.	Not identified.	One puncture and one scratch on inner edge of right hand. Severe pain in limb. * No subcutaneous inflammation.	Free salivation. Drowsiness. Retching. Eyes half open? Convulsive seizures. Inability to speak. Constriction of throat?	None.	None.	1½ hours+	Practically recovered in 8 hrs; Well in 24 hrs.	Recovery.	45 grain in 1 hr. 20 minutes and 15 grain more in next 2½ hrs.		Male at 21. *Bite probably not very severe. Nature of snake? Was improvement post hoc or propter hoc? Evidence is insufficient to decide.
26	Dr. Reddie, Civil Surg., Hardoi.	I. M. G., Sept. 1893.	Not identified.	2 minute punctures close to each other on dorsum of index finger of left hand. No subcutaneous extravasation.	None recorded.	None recorded.	Unconscious.	1½ hrs.	4 hrs.	Recovery.	10 gr. hypod. 10 gr. by mouth in 2½ hrs.	Ligatures. Whiskey.	Girl at 13—14 years. Symptoms of fear were present but no symptoms or signs of poisonous snake-bite.
27	Surg.-Lieut. Colonel Oswald Baker	I. M. G., Feb. 1894.	Russell's Viper. (Daboia Russelli)	2 small punctured wounds on right ankle. Subcutaneous ecchymosis.	No symptoms.	No symptoms.	No symptoms.	1½ hrs.	Never ill.	Recovery.	10 gr. at once.	Ligature. Incision and antiseptic dressing.	At the time of this snake-bite, the snakes in Burma are shedding their skins and are sluggish. Female at 35 years ±.
28	Asst. Surg. B. Fitzpatrick	I. M. Record, 1st Aug. 1894.	Cheetha. Identification rests on native opinion only.	Distinct fang puncture on 4th toe of right foot. Ecchymosis around bite.	If any?	None.	Semiconscious. Collapsed. Foam exuding from mouth. Muscular rigidity of arm and legs.	1½ hrs.	10 hrs ±	Recovery.	15 gr. in 4 hrs.	Ligatures. Free incision. Locally Liq. Ammonia and Permanganate of potash. Brandy and Ammonia internally	Strychnine dose very small. If a poisonous snake bite. Symptoms do not point to such. Female at 33.
29	Surg.-Capt. H. E. Drake Brockman.	I. M. G., Nov. 1893.	Not identified.	Punctures on left foot. Nothing more recorded.	Foaming at mouth? Became comatose. Respiration almost paralysed.	Spasms of face. Rigidity of abdominal muscles.	Pulseless. Respiration feeble. Pupils dilated. Comatose.	1½ hours.	10 hrs.	Recovery.	1 grain in 1 hr.	Ligature. Incision. Stimulants.	Adult male. Evidence scanty. (A.) as to nature of snake; (B.) as to presence of poisonous snake symptoms. (C.) Fear probably played a strong part. A patient was admitted to the General Hospital, Madras, not very long ago with symptoms similar to those here described. He had been struck by a rope and thought a snake had bitten him.

Snake-bite.—(continued).

Snake-bite. — (continued).

No. of Case.	Reported between.		Result.	Treatment		REMARKS.	
	By	(B) Bite and Recovery or death.		By Strychnine.	By other means.		
30	Surg. Major. I. F. Thomas of Chingleput.	1	7 hrs.	Recovery.	3½ grain in 7 hrs.	Liq. ammonia internally. Liniment to body. Mustard poultice to cardiac region.	Male at 30 years. Dr. Thomas only gave two (2) injections and then left the case to the care of a Hospital Assistant. † He seems uncertain as to the amount of Strychnine given.
31	Surg. Major. W. H. Cadge, I. M. S. and Surg.-Capt. J. J. Pratt, I. M. S.	Oct	12 hrs.	Recovery.	(1) 35 gr. hypod. in ½ hr. 1½ hour interval. (2) 30 gr. hypod. in 50 minutes.	Crucial incision and Permanganate locally, ligature. Local treatment within ½ hour of the bite.	Male at 12 years. N.B.—(i). Local treatment prompt and right; likely to be efficient. (ii). Drowsiness * fully accounted for by previous Strychnisation. (iii). Absence of symptoms of snake poisoning throughout. (iv). Danger from Strychnine. (v). Situation of bite favourable for treatment.
32	Surg.-Lt.-Col. H. Waller Barrow, M.B., A. M. S.	on	? if any symptoms.	Recovery.	? Amount. Given till muscles around punctures twitched violently.	None recorded.	Adult male European Soldier. Mansat on latrine seat, and seems to have crushed the snake which accordingly bit him. Under such circumstance the snake probably did not strike efficiently.

Foot note to p. 50.

† Medical Association, October, 1893. Foot note to p. 50.

An Analysis of the Recorded cases in which Strychnine has been used as an Antidote for Snake-bite.—(continued).

No. of Case.	Reported		Identification of the Snake.	Local Signs.	Symptoms.			Interval between.		Result.	Treatment		REMARKS.
	By	In			Refferible to Snake-bite.	Refferible to Strychnisation.	Refferible to other Causes.	(A) Bite and commence-ment of Strychnia treatment.	(B) Bite and Re-covery or death.		By Strychnine.	By other means.	
30	Surg. Major. W. F. Thomas of Chingleput.	I. M. G., Oct. 1893.	Cobra?	Wound on left ankle near outer aspect of joint.	None cited.	None.	Come within 1 minute of bite.	1 minute	7 hrs.	Re-covery.	3½ grain in 7 hrs.	Liq. ammonia internally. Liniment to body. Mustard poultice to cardiac region.	Male aet 30 years. Dr. Thomas only gave two (2) injections and then left the case to the care of a Hospital Assistant. † He seems uncertain as to the amount of Strychnine given.
31	Surg. Major. W. H. Cadge, I. M. S. and Surg.-Capt. J. J. Pratt, I. M. S.	I. M. G., Oct. 1892.	Cobra (carefully identified), 3 feet 3 inches long, fang and sac present on one side, destroyed on the other in killing the snake.	Distinct puncture on upper and inner surface of great toe, bleeding slightly (left foot); local Ecchymosis, tingling and numbness of foot.	"No marked symptoms of any kind" either on admission or later with the exception of those due to Strychnine.	Tetanic Spasms. Vomiting Drowsiness.* 1½ hrs. later. Severe tetanic spasms. Pulse fluttering. Respiration almost ceasing. Death from strychnine threatening.	Surface cold? a little drowsy.	1 hr.	12 hrs.	Re-covery.	(1) 35 gr. hypod. in ½ hr. 1½ hour interval. (2) 30 gr. hypod. in 50 minutes.	Crucial incision and Permanganate locally, ligature. Local treatment within ½ hour of the bite.	Male aet 12 years. N.B.—(i). Local treatment prompt and right; likely to be efficient. (ii). Drowsiness * fully accounted for by previous Strychnisation. (iii). Absence of symptoms of snake poisoning throughout. (iv). Danger from Strychnine. (v). Situation of bite favourable for treatment.
32	Surg.-Lt.-Col. H. Waller Barrow, M.B., A. M. S.	By private letter.	Echis Carinata	Bite on thigh. Some pain about wound.	None recorded.	Violent twitching of muscles around punctures.	None recorded.	Very soon after bite.	? if any symptoms.	Re-covery.	? Amount. Given till muscles around punctures twitched violently.	None recorded.	Adult male European Soldier. Man sat on latrine seat, and seems to have crushed the snake which accordingly bit him. Under such circumstance the snake probably did not strike efficiently.

† See Surg.-Major Thomas' answers when asked for further details, in the Transactions of the South Indian Branch of British Medical Association, October, 1893. Foot note to p. 50.

An Analysis of the Record cases in which Strychnine has been used as an Antidote for Snake-bite.—(continued.)

which Strychnine has been used as an Antidote for Snake-bite.—(continued.)													
No. of Cases.	Reported		Identification of the Snake.	Local signs.	Symptoms.			Interval between.		Result.	Treatment		REMARKS.
	By	In			Refrerrable to Snake-bite.	Refrerrable to Strychnisation.	Refrerrable to other causes.	(A) Bite and commencement of Strychnia treatment.	(B) Bite and Recovery or death.		By Strychnine.	By other means.	
3-36	R. P. Banerji Pachbadra, Rajputana.	I. M. Record, 1st July 1892 and I. M. Record, 1st November 1892.	* Snakes were identified by Dr. Banerji, but the identification broke down completely when the reptiles were submitted to a competent authority. See Surg. Capt. Tull Walsh's article in I. M. Gazette, Sept. 1893, pp. 323-4.	...	Very scantily reported.	...	...	...	...	Recovery in all six cases.	In one case at least, Dr. Banerji only had the treatment on hearsay evidence.	...	* These cases cannot be accepted in evidence. See further. Dr. Banerji's reply in I. M. G., Dec. 1893, and Surg. Capt. Tull Walsh's reply in the same paper.
39	R. P. Banerji	The Medical Reporter, 16th June 1891.	Not identified.	One puncture bleeding and with ecchymosis edges and one scratch, both on dorsum of the foot.	None except dilatation of the pupils.	Twitching of facial muscles after 1 gr. on 4th day.	Excessive thirst. Dryness of mouth and tongue. Temperature subnormal. Tremulousness. Severe frontal headache; injected conjunctiva; dilated pupils. Talkativeness and incoherency. Inability to stand up. Inco-ordination. Later. Profound sleep. Stertorous breathing.	3 hr.	6 days.	Recovery.	6 gr. in 2½ hrs. on 1st day. 2 gr. in one dose on 3rd day. 1 gr. in one dose on 4th day.		Male wt. 45. † An excellent description of an intoxicated man. Conclusion. An injury to the foot possibly a harmless snake-bite in an intoxicated man.
40	R. P. Banerji	The Medical Reporter, 16th August 1894.	Identified by Dr. Banerji as Echis Carinata—see note on identification of cases 33-38.	Two puncture on radial side of little finger, bleeding and ecchymosed, the other superficial. No pain from bite.	Irides widely dilated; severe retching; 2nd day. Saliva tinged with blood.	None.	Mouth dry. Severe frontal headache. Pupils dilated. Later. Breathing stertorous. Unconscious. Incoherent ideas wandering.	1 hr. 45 mins.	48 hrs.	Recovery.	1 gr. injected in ½ hr. Then for 1½ hrs. none given, then 1 gr. in 6 hrs. by mouth. Next day 1 gr. injected.	No ligature used purposely—this justifiable? See Wall, p. 148.	Male wt. 23 years. N.B.—No mention of convulsions; bloody discharges or albuminuria—See Wall, pp. 79 to 83. † Local pain severe in viper bites—See Wall, p. 64.

An Analysis of the Recorded cases in which Strychnine has been used as an Antidote for Snake-bite.—(continued)

No. of Cases.	Reported		Identification of the Snake.	Local signs.	Symptoms.			Interval between.		Result.	Treatment		REMARKS.
	By	In			Refrerrable to Snake bite.	Refrerrable to Strychnisation.	Refrerrable to other causes.	(A) Bite and commencement of Strychnia treatment.	(B) Bite and Recovery or death.		By Strychnine.	By other means.	
41	R. P. Banerji	The Medical Reporter, 1st June 1894	By Dr. Banerji as Daboia Russellii. He first took it for an Echis Carinata. Dr. B. kindly sent the writer 5 specimens which he had labelled Daboia Russellii. They were all typical specimens of Echis Carinata. See also note on cases 33-38.	Two punctures above and behind left 5th metatarso-phalangeal joint. One is ecchymosed.	Pupils dilated? Unconsciousness supervening? Blood in vomit and stools.	Collapse on 25th July 1893 after 20 m of Liq. Strychnine by mouth. Purgings 3 hours later. Were the vomiting and bloody stools on 24th due to Strychnine?	Frontal headache hurried breathing. Skin pale face pinched. Pupils dilated. Incoherent. Extremities cold. Unconsciousness supervening.	1 hour.	7 days.	Recovery	6 grs. in 2 hours. After 3½ hours interval 2 grs. 2 hours later 2 grs. Etc.	Ligature applied by patient.	Possibly a case of Echis bite, complicated with drink. The man recovered from his previous malarial fever and a large dose of Strychnine but notes do not show that Strychnine influenced the recovery. See notes in this column on previous case (No 40).
42	Surg.-Capt. S. E. Prall, M.S. I.M.S.	I. M. G., Oct 1894.	Young Cobra 16 inches long.	Both hands swollen. Puncture marks on terminal joint of Right thumb. Later blackened.	Drowsiness. Inability to salivate. Cold skin. Loss of smell. Could be roused. Answers intelligible.	sat up. Muscular spasms after dose (iv). Strychnisation continued for 5½ hours.	None.	Very soon. Probably less than an hour.	...	Recovery	(i) 11-30 A.M. 15 gr. (ii) 12-30 P.M. 15 gr. (iii) 1-30 P.M. 15 gr. (iv) 3-30 P.M. 15 gr.	...	Half-witted Male wt 30. (a) Cobra very small. (b) No improvement after first 3 doses. When fourth dose was given he had been suffering 4½ hours. In the next 2½ hours he improved very much. The on symptom of improvement noted as at once observed was muscular spasm. How far did the Strychnine contribute to the recovery?

NOTICE.

The attention of members is invited to the following by-law of the Branch and circulars issued by the Surgeon-General with the Government of Madras.

BY-LAW XII.

Members absent from Madras are invited to send papers of professional interest to the Secretary, by whom they will be read at the Meetings of the Society, and all matters of general or special value will be printed and circulated.

CIRCULAR No. 29.

As pathological specimens are greatly required for the Medical College Museum, the Surgeon-General with the Government of Madras, requests that Medical Officers and subordinates having opportunities of so doing will contribute towards it. The specimens most needed are those illustrating injuries to bone and their repair, and tumours of all varieties. A short history of the case should accompany each specimen, which should be sent to the Curator of the Museum. All expenses incurred in packing and forwarding specimens will be repaid by the Principal, Medical College.

By order,

(Signed) A. J. STURMER,

SURGEON,

OFFICE OF SURGEON-GENERAL
WITH THE GOVERNMENT OF MADRAS,
Fort St. George, 14th July 1880.

Secy., Surgeon-General
with the Government of Madras.

CIRCULAR No. 26.

The attention of District Medical Officers is directed to Circular No. 29 of the 14th July 1880 from this office.

The Surgeon-General considers that a very large field for the collection of pathological specimens illustrative of the diseases of this Presidency, is open to Medical Officers in charge of up-country stations, and he hopes that in future they will more fully avail themselves than they have hitherto done, of the opportunities which may occur in the course of their professional duties, of collecting pathological specimens and forwarding them for record in the Medical College Museum.

By order,

(Signed) C. M. THOMPSON, M.B.,

SURGEON,

OFFICE OF SURGEON-GENERAL
WITH THE GOVERNMENT OF MADRAS,
Fort St. George, 23rd Sept. 1887.

Secy., Surgeon-General
with the Government of Madras.

TRANSACTIONS

OF THE

SOUTH INDIAN BRANCH

OF THE

BRITISH MEDICAL ASSOCIATION.

Is Strychnine of any value as an Antidote to Krait, Daboia or Echis poison. SURGEON-CAPTAIN ELLIOT, M.B.

Madras:

PRINTED AT THE LAWRENCE ASYLUM PRESS, MOUNT ROAD.

1895.

Is Strychnine of any value as an Antidote to Krait, Daboia or Echis Poison. By Surgeon-Captain ROBERT HENRY ELLIOT, M.B., B.S., London, F.R.C.S., England, D. P. H., Cambridge, &c., I. M. S., Acting Professor of Biology, Presidency College, Madras.

Last October it was my privilege to read before this Association, a paper on the value of Strychnine as an antidote to Cobra poison. To-day I propose to lay before you the work, which I have subsequently performed in an endeavour to ascertain, whether the reputed antidote was of any value, in the treatment of the bites of the other common poisonous snakes of Madras, which, as we all know, are the Daboia, Echis and Krait. There is a further point that leads me to address you again, *viz.*, that since the publication of my last paper, a number of fresh cases have appeared. These consist of scattered records in the various journals, and also of a most interesting series of cases by Surgeon-Lieut.-Colonel Joshua Duke, in his paper read before the Medical Congress last December. I propose, Gentlemen! after describing to you the results of my recent experiments, to critically review these different cases.

In order to obtain a stable basis, on which to work, let me premise my remarks, by a few words on the symptoms, etc., of poisoning by the Krait, Daboia and Echis. A comparison of the experiments in Appendix I. with those recorded in my previous paper will show how strikingly similar are the symptoms of all the various forms of snake-poisoning.

To begin with that of the Krait. In this a marked feature is a great tendency to tremulousness, twitching and convulsions, a condition being thus attained, which so closely simulates strychnisation, that in cases, where the alkaloid had been injected, it was at times difficult, if not impossible, to be sure whether the symptoms of motor excitement observed were due to the drug or the venom. To this very important point I shall again allude later on. Salivation, as a symptom, was conspicuous by its absence, but in some of the monkeys, peculiar chewing movements were noticed, which suggested that the animal had something in its mouth, which it was trying unsuccessfully to expel. Possibly this was viscid saliva.

The typical symptoms of Cobra poisoning in monkeys, as described in my previous paper, were repeated exactly in the Krait-

poisoned animals. I refer to the drowsiness, the drooping of the eyelids, the drunken-like inco-ordination, and the apparent delusions. Where life was sufficiently prolonged, intestinal hæmorrhage occurred. This was rarely manifested during life by blood in the stools, but a *post mortem* constantly revealed submucous extravasations of blood, except when the animal died almost at once, from an overdose of the snake-poison. A subcutaneous jelly-like bloody extravasation around the wound, was also a constant feature.

Now as to the symptoms and signs of Daboia-poisoning:—

Here again one finds a tendency to motor excitement as the result of the injection of the venom, but I must confess that this phenomenon was not so well marked as the records of other observers had led me to believe. Nor was I able in any case by tapping the forehead, or by any sign the animal exhibited to ascertain the presence of 'the severe frontal headache of viper-bite.' The snakes I used were very fine Daboias, and the poison was injected usually about three days after its expression from the dissected glands. The symptoms noticed in a dog bitten by a Daboia were precisely similar to those observed in the animals, into which the poison was injected by a syringe. I confess myself at a loss to explain the difference between my own observations and those of other writers, and can only record facts and leave them as they stand for the present. One more point there is and on this I speak with less hesitation. I refer to the fact that dilatation of the pupil was in my experiments very far from a constant sign, whilst others have laid much stress upon it. When the animal survives long enough, hæmorrhage from the bowel takes place, and if life is still further prolonged most offensive melanic stools are passed. Salivation though noticed in one case was by no means, the rule.

In monkeys, the classical symptoms already alluded to were constantly present.

A very striking point was the extensive spread of the local lesion. The red currant jelly-like substance was far more plentiful than in cobra-poisoning. It tracked for a great distance along the lymphatics and apparently also spread directly in the planes of cellular tissue. Even where it appeared to follow the lymphatics, the cellular tissue surrounding these showed marked changes of

the same inflammatory character, presumably from the direct osmosis of the poison through the vessel walls. This venom appears to me to be both more irritative and more diffusible than the colubrine poison.

From the above brief review of the leading symptoms of snake-poisoning, we turn to the consideration of the effect of Dr. Mueller's antidote.

Surgeon-Lieut.-Colonel D. D. Cunningham in his excellent paper on this subject, before the Medical Congress at Calcutta, made the following incisive remarks:—"There is one somewhat quaint point in regard to the belief in the efficiency of the salts of Strychnia as antidotes for snake-venom. Its adherents seemingly regard these salts as constituting a universal panacea against the action of all kinds of venom. But this implies a belief that in some cases they act homœopathically, and in others allopathically, for in cases of acute viperine poisoning, the symptoms in many cases are those of extreme irritation of the nervous centres, whereas in cases of cobra poisoning, they are indicative of nervous depression. The symptoms of acute viperine poisoning in many cases are practically identical with those of acute strychnia-poisoning, and yet it is seriously proposed to endeavour to induce the latter in order to cure the former."

These words I can heartily endorse, and my grounds for so doing I will now show you. A reference to the cases in Appendix I. will show that the strychnised animals died sooner than those which were allowed to cope with the snake poison alone; but this is not all, and to the following point I particularly beg your attention. In this series of experiments I was determined that strychnine should have its fullest chance; accordingly the experiments were made in pairs or in fours, and the venom was equally divided between the two or four animals. In each set of experiments the animal which suffered first and most severely was made the control snake-poison experiment, while the animal which by reason of greater body-weight, greater life force, or other circumstances, was the slower to feel the effects of the poison, and which, therefore, *ceteris paribus*, would have been the longer in dying was used for the antidotal test. This method of operating brought out a very striking point, and absolutely supported Dr. Cunnings-

ham's remarks, for in every case, very soon after the alkaloid was administered, the animal rapidly became markedly worse, and as you will see, generally died before its weaker neighbour. I may say that these experiments were carried out before I saw Dr. Cunningham's paper, and I had the honour independently to arrive, on practical grounds at the same conclusion that that observer's acumen led him to adopt from theoretical considerations. I shall best illustrate my point by referring you to a striking pair of experiments, viz., Experiments V. and VI. of the Daboia series, Appendix I. B.

The weight of the animals were practically identical, they were both in good health, the snake-poison was accurately weighed, and evenly divided between the two dogs. Strychnine was given to one, on Dr. Mueller's plan of full doses, and the animal whose hap it was to be treated, succumbed to the combined influence of venom and alkaloid.

The remaining animal fought its battle uninterfered with. In twenty-four hours it was as well as ever, and at the end of a week it rejoined its village companions, in decidedly better condition than when it entered my compound! Needless to say I refer the improved condition to regular food, and not to the snake-poison.

While one animal apparently owed its death to the combination of virus and remedy. I can confidently state that, from beginning to end, I never saw one atom of benefit derived from the administration of strychnine. In no single case were the symptoms even temporarily removed, and I do not hesitate to say that, while I believe the so-called antidote to be useless or worse than useless in cobra poison. I go farther, and consider that, with the facts before us, its administration in krait or viperine poisoning must be, if not malpraxis, at least a grave surgical error very difficult to defend. I am aware than I am speaking strongly, but I have chosen my words after careful thought, and in the belief that in so doing, I am discharging a duty, which I may not leave undone.

Now a few words on the Echis. There seems always to have been a good deal of dispute about the virulence of the venom of this snake. Fayrer considered it a dangerous viper; some of his correspondents called it deadly, others have thought lightly of its

bite. The Echis of these parts seems to be a much smaller animal than the specimens met with up North. Fayrer speaks of a fine specimen 22½ inches long. Babu Banerji kindly sent me several specimens, which are considerably larger than those met with in these parts. Out of seven specimens I have secured here the longest measured 15 inches. Dr. Browning and Dr. Henderson tell me that their usual size in Madras does not exceed this measurement. The Echis is a very vicious little viper and can always be relied on to bite at a minute's notice.

I endeavoured at first to extract and inject the poison as I had done with the other snakes, but the combined venom of three specimens of Echis was only sufficient to kill two guinea-pigs, and that too after a delay of about seven hours. I accordingly experimented on dogs, making the vipers bite the dogs (Appendix IV). In no case did I succeed in killing a dog by means of the bite of a single viper, though one dog bitten by four vipers in different places succumbed in 8½ hours.

With the exception of the local swelling, the symptoms in this case were by no means pronounced. The dog became ill and died, much in the same way as if cobra-bitten, but as it was not closely watched in the last 4 to 4½ hours of life, I would not lay stress on the absence of convulsions, etc.

I may mention lastly an important point which is, that in the course of a talk with a gang of snakemen, I asked if they considered the Echis—a specimen of which they had just brought me—deadly or not. They ridiculed the idea of a man dying from its bite, and prophesied that a dog bitten by these snakes would not die, the damage being confined to great swelling of the bitten part. My results which you may see in Table IV. amply justified their confidence. In order to prove to me its harmlessness, one man volunteered to be bitten by an Echis. I asked each of the four present in the gang, if they would consent to be bitten, and received a willing affirmative in each case. Thinking that they might be 'bluffing,' and not wishing to push the matter too far, lest they really should be bitten, I gave them another test by saying—'No, I don't want to see you bitten by the Echis, but will you let that snake (a Daboia) bite you?' The answer was a most emphatic negative. They began to think me dangerous, so I reassured them by saying

that I did not wish them to be bitten by any snake. They seemed a little disappointed, for I believe, that there floated in their minds dim visions of a not unremunerated *otium cum dignitate*, within the precincts of my compound till such time as convalescence should be established.

I believe their statement most fully, and I should have no serious fears, were I myself, bitten by an Echis, but I did not allow their proposition to be carried out, as I think a stronger case is necessary to justify *vivisection on man*.

With these facts before me, I did not consider it worth while to try the influence of Strychnine as an Antidote to Echis poison for I am satisfied that the Echis, as met with down here is not a deadly snake, and I am unable to obtain specimens from the North. Throughout my experiments with this snake, I have failed to make out either the frontal headache or the dilated pupil, on which some writers have laid so much stress.

I come now, gentlemen, to a discussion of the cases published, since my last paper, and in so doing, I adopt my old plan of classification. The cases fall under two heads, those in which the snake was *identified*, as a deadly one, and those in which it was *not so identified*. The latter being again sub-divided into those, which show signs of true snake-poisoning, and those which do not. This is, however, not the classification adopted by all writers for Dr. Duke in his paper before the Indian Medical Congress, as reported in the 'Englishman' of January 9th, said: "It is a habit and a *bad* one, where the snake has not been killed or properly viewed, to class recoveries under strychnia as the result of the bite of a *harmless snake*, etc." I would add a rider to that statement and say—"It is also a habit, and a *worse* one, where the snake has not been identified, and where distinct and undoubted signs of Thanatophidial poisoning do *not* exist, to assume that the *snake is a poisonous one*, and by including such cases in statistics to absolutely vitiate the value of those statistics." Gentlemen, I leave you to judge which mistake is the more dangerous one. Surely this is the last country where one would accept unhesitatingly a man's statement that he has been bitten by a poisonous snake. Every bite a native receives, in which the offender is unseen is a 'snake-bite', and every snake a native sees, be it the harmless Dryophis or the deadly Daboia is to him a *most poisonous snake*.

No case should be included in our statistics, unless a reliable observer identifies it carefully, or unless there is good and clear evidence of Thanatophidial bite, such as drooping of the lids, inco-ordination with feeling of drunkenness and drowsiness. How uncertain our results may even then be will be best learned by a reference to the cases in Appendix IV.

I myself saw a large powerful Daboia strike fairly at a dog, hold it, shake it, and only let go, when the dog had fled yelping several yards, dragging the snake along the ground. The part bitten was soft and fleshy, the bite was apparently a fair one, the glands of the snake, when dissected, though emptier than usual, both proved to contain poison. From one gland alone I obtained more poison than another Daboia emitted through a leaf in a vigorous bite.

Add to all this, that there was well-marked subcutaneous extravasation around the bite, and the case seems perfect. I was on the point of trying Strychnine as an antidote, but fortunately a '*laissez, aller*' plan was adopted, and the animal, though it became rather ill, did not die. Appendix IV., case 1).

Eight days later the same animal was fairly struck by a vicious Daboia, the bite being almost instantaneous in its shortness, and this time the victim died in less than three hours. (Appendix IV., case 2).

Surg.-Major Browning met with a similar case, and knowing the interest I take in these things, he very courteously wrote to me about it. I will read you his own words—"A healthy cobra bit a dog in two places with no result—another bite from the same cobra on the same animal resulted in death." Dr. Browning also sent me the notes of an interesting case, published in Appendix V. in which a grass-cutter girl bitten by an Echis 10 inches long recovered with the aid of only local treatment.

Add to these cases the results of the experiments on Echis bite in Appendix IV. and you will, I think, be with me, gentlemen, when I say, that in collecting evidence of cure for snake-poison, "all is not gold that glitters."

Let us take the new cases *seriatim*. You will find them in Appendix II, and will see I have continued the numbering from my last paper.

Cases 48, 49 and 50 are by T. A. Maieckam Pillay, C. M. S. All these cases were lacking in identification of the snake, and in symptoms of Thanatophidial bite. In two out of the three signs of strychnisation appeared.

Case 51 is another death. There were undoubted symptoms of snake-poisoning. Strychnine was liberally given, 24 gr. being administered in $\frac{1}{2}$ hour to a child of 10. No improvement was noted, and the child died. One cannot but notice two points in this case; one is that local treatment is not even alluded to, and the other that Strychnine convulsions closed the child's life.

I come now to a case, which has been made a good deal of, viz., Case 52. To my mind it is by no means convincing. Let me draw attention to the following points:—(1) Dr. Baker speaks of the snake as a full-grown one, 3 feet long. Full grown Cobras run from 5 to 6 feet in length: this was therefore a half-grown specimen. (2) The man was a snake charmer. It is a not uncommon practice among these men to extract the poison before removing a fang. This man was engaged in removing the fang, and it is significant that the tooth he was busy on had an empty poison sac, while the other fang, which was *hors de combat* from an old injury, had a full sac. It is at least probable that the man had emptied the dangerous side before he commenced operations. (3) The symptoms came on slowly, and, as the notes show us, were not removed by the Strychnine. In fact after each fresh injection we learn that there was 'no improvement.' At last after a long continuance of this state of things, the tide turned, and the man gradually recovered. The obvious interpretation seems to me to be, that the patient received a small dose of cobra poison, and rallied from it by his own natural powers in spite of the Strychnine, which is not proved to have benefited him at all.

Case 53 seems to have been bitten by an Echis. The patient struggled on for a day and a half and then Strychnine was given. Death closed the scene about an hour after the new course of treatment was commenced.

This case gathers in force when considered along with case 73 in which the patient survived for 24 hours before Strychnine was given. Within an hour of the first administration of the alkaloid the

man was dead. I do not say that the Strychnine killed the patients and I bear in mind that both of them were very ill before the alkaloid was given but the coincidence is worthy of attention.

Cases 71 and 72 are by Dr. Jones.

In 71 the bite seems to have been undoubtedly inflicted by a Cobra. The thanatophidial symptom are typical; the patient when admitted was well under the poison but was not in extremis Strychnine was freely given (1.35 gr. in $\frac{3}{4}$ hr.), but without the least advantage.

Case 72 is far from convincing. The snake was only seen by an agitated native woman whose daughter had just received a wound which she probably deemed a most dangerous one, and yet the description she gives is almost worthy of a scientist sitting at his desk with a specimen before him. Granting the validity of her description, however, the snake is as likely to have been a *Lycodon* which closely resembles the Krait in appearance, as it is to have been a Krait. At all events the Krait is not a *viper*, (the recorder is in error here) but is one of the poisonous colubrine snakes, and as such, would not be likely to have inflicted the four-marked bite described here.

As to the blood that came from the girl's mouth it may have been due to a local injury inflicted by her teeth in the fit described, which fit was probably due to fright. I have been unable to find any *valid* evidence to show that Indian viper or krait bite is attended by hæmorrhage from the mouth either in man or animals, though I am of course, familiar with the submucous and subserous hæmorrhage of the alimentary canal and lungs found under these conditions.

As to the rest of her symptoms, I think that we shall not outrage probabilities by ascribing them to fear.

Now as to Dr. Duke's cases. I fear I must differ from that writer in my method of classifying them. As I have already discussed the published cases he refers to, I will not again allude to them, but will confine my attention to his own cases.

They are the most instructive group of cases yet recorded, and had not Dr. Duke been led to place an undue value on the records of other observers, notably on Dr. Banerji's cases, I have no doubt that his own experience would have led him to reject Strychnine for ever.

To begin with, out of seventeen cases, Dr. Duke had nine deaths under the Strychnine treatment. Of the eight recoveries, he admits that it is doubtful whether the snake was poisonous in Cases 1, 2 and 3, while in case 14 the offender was a grass green snake, which produced no serious symptoms. I only know one snake in the plains answering to this description, and that is the very innocent and very common *Dryophis Mycterizans*. Four cases remain, I have it on Dr. Duke's own authority that in none of these Cases was the snake brought in for identification. Nevertheless Case 6 is unhesitatingly pronounced a Cobra bite. We are told that the symptoms were severe, convulsions being frequent. This is in itself a strange history, and one that excites suspicion, for neither in men or animals does one find convulsions as a symptom of Cobra-bite, till the patient is absolutely moribund. Lastly, I may say that in a letter Dr. Duke wrote me, he candidly owned, that the evidence, on which he attributed the cures in these cases to Strychnine, was his faith in the reputation of the antidote. Science, gentlemen, as I need not remind you knows no such law as faith, and judged on the standard of hard facts. Dr. Duke's cases read to me thus. In eight of them no evidence is forthcoming of Thanatophidial bite and these may therefore be excluded. The remaining nine all died whether from the venom or the remedy or both, it would be hard to say.

To my mind Dr. Duke's cases are the most damning evidence against Strychnine yet to hand, and I think it a high tribute to his integrity of purpose, that in spite of the views he held, these cases were ever put on record. I say 'held' advisedly, for Dr. Duke has practically owned to me his conversion from the belief, of which he was the quondam champion. I desire to take this opportunity of thanking him for the kindness, openness, and freedom from prejudice, with which he has assisted my enquiries.

Before quitting this subject, allow me to allude to two methods of treatment, which have been recently suggested more or less, as the outcome of the use of Strychnine.

The first of these is a custom against which I would raise a most emphatic and earnest protest. I refer to the neglect of the ligature in the treatment of snake bite. Some indeed have not

been content with having left undone the good which they ought to have done, but have gone so far as to undo the good which others had done, I mean that one finds in the records of cases, instances in which observers relying on the efficacy of strychnine have been tempted to remove the ligatures that wiser if less educated hands had applied.

I am aware that much latitude must always be allowed for individual opinion in the treatment of any particular case, and I would be the first to give that latitude to any one who keeps within ordinary bounds. Vicious to the patient as I believe the administration of strychnine to be, I can understand the position of those who do not agree with me now, and who therefore administer it, but nothing to my mind, can defend the practice of depriving a patient of that refuge from his fate which the exclusion of the snake venom from the general circulation affords. The value of the application of the ligature has been proved up to the hilt by experiment; on common physiological grounds its utility is self evident, and as a method of treatment it has been recommended by names that will live to all time in the history of snake poison research, names such as those of Fayrer, Wall and Richards, nay more it has received the approbation of every trustworthy medical officer in this country, who by actions which speak louder than words has hastened to apply the ligature as soon as he has reached his snake-struck patient.

Gentlemen! I fear that this example may prove infectious and that many of our subordinates with the best intentions may be led into the same error. It is urgently necessary that we should speak out clearly against this evil and nip in the bud what may otherwise prove a source of danger to the lives we are bound to protect, and a source of discredit to the practice of Medicine in India.

The other method of treatment alluded to was suggested by Dr. Lauder Brunton. That able writer has proposed washing out the stomach with Condy's fluid in snake bite, on the grounds that the poison is excreted through the mucous membrane of the stomach and that we are by this mode of treatment able to neutralise it and prevent its re-absorption by the mucous membrane.

There are, however, two flaws in this argument. I speak, gentlemen, with the very greatest respect for the man whom the

whole world of science esteems and rightly esteems so highly, and whose pupil I had the honour erstwhile to be. Dr. Brunton will be one of the first to yield to facts and two facts face us here.

1st.—If you will turn to Appendix III. you will notice that I found it impossible to poison animals with even large dose of viperine or colubrine poison taken by the mouth on meat. I am aware that Fayrer killed fowls by the administration of snake poison through the mouth, but my experiments which some of you have witnessed have led me to conclusions different from those of that great observer. I may say that Dr. Browning has also independently arrived at the same result by his work on this subject.

2nd.—A reference to the cases in which *Post mortems* were performed will show that the excretion of the poison as evidenced by submucous hæmorrhage does not take place so early or so markedly from the stomach as it does from the lower part of the small gut and from the great gut. Submucous hæmorrhage in these latter portions of the alimentary tube were the rule, while bleedings from the stomach or upper part of the small gut were rare. I am inclined to believe that the excretion takes place through the solitary and agminated patches of adenoid tissue in the bowel.

Obviously, gentlemen, it would be useless to wash out the stomach under these conditions, while it would be a needless source of irritation to the patient who needs above all things to have his strength husbanded that he may be able to fight out his battle for life unhampered.

The sense of my many obligations again comes over me, and I feel my powerlessness to rightly express my gratitude to the many, who have so freely and generously given me their help in my work.

In Madras the Surgeon-General, Surg.-Lt.-Col. Allison, Surg.-Captain Thomson, Mr. Jones and others have doubled the debt I owe them, while as to Surg.-Captain Giffard, I can only say, that much of the work, I have put before you, has been his almost as much as my own. Equally generous has been the help I have received from many who are not serving in this Presidency. Of these I would mention Surg.-Lieut.-Col. Cunningham, Surg.-Lieut.-Col. Joshua Duke, Surg.-Captains Buchanan and Bird, and Mr. Kanthack.

Once again, Gentlemen, in closing my second paper on this subject, let me say that I have no wish to make converts by the sword of controversy. Mine it has been to lay facts before you, and then to leave you to judge each one for yourselves, but I would press home on you and on each one, whom this paper may reach, that the subject we are dealing with, is no mere child's play. It is a matter of life and death to hundreds, if not to thousands, and it behoves us to think well, nay more to think our best, and having thought, to throw the whole weight of our influence into the scales on one side or the other.

If Strychnine be the hope of the snake-bitten wretch, fight for it. If it be a spectral delusion, a shadow of death to rob the living of precious life, and such I believe it to be, away with it, and the sooner the better.

Surgeon-Major Browning said, that although he had not been able to see the full text of Surgeon-Captain Elliot's present paper, that he had seen sufficient to enable him to say he concurred, generally, in the views expressed by the author.

Assistant-Surgeon Robertson and himself had conducted some experiments with *Echis* at Guindy, where the snake is very common, he had furnished Surgeon-Captain Elliot with a brief note of the cases. He had never seen an *Echis* over 16 inches in length, he thought it just possible that an *Echis* might kill a child or a very weakly adult, in the same way, as scorpion stings were alleged to destroy life. He had a curiosity at Guindy in the shape of a common house rat that had killed three *Echis* without suffering in any way. The snakes each time struck at the rat savagely and repeatedly but no trace of blood could be seen on the animal.

With reference to the general question of strychnine as an antidote to snake-bite, he regretted that he had not been present at the former meeting, he cordially endorsed all Surgeon-Captain Elliot had said regarding its uselessness as an antidote. At Guindy they had experimented with the cobra, daboia, and bungarus, using strychnine subsequently, in all cases "the dog it was that died". In January 1894 he had written in, officially, to the Surgeon-General on the subject and amongst other things

protested in the very strongest manner possible against the indiscriminate use of strychnine. He had carefully read all the recorded cases of alleged cure and keeping in view the various possibilities of error he had not seen a single case in which, it had not occurred to him that, conclusions were arrived at on insufficient grounds.

Surgeon-Major Browning showed, in connection with Surgeon-Captain Elliot's paper, specimens of *Echis* and *Dipsas Trigonatus*, the latter, kindly, identified by Mr. Thurston. Natives of this country he said considered the *Dipsas Trigonatus* a very dangerous snake, it was however quite harmless. The general colouring of the snakes when alive was not infrequently confounded, no one who noted that the two were not infrequently confounded, no one who noted the typical V mark of the *Echis* the vertical pupil, and the general viperine type of body could fall into such an error.

Appendix I. A. Krait Poison and Strychnine. Experiments on Monkeys.

Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc, noted.	Remarks.	Time elapsed between 1st Injection and Death.
I. 22-12-94.	1 lb. 11 oz.	Krait Control.	Krait Poison.	gr. $\frac{1}{2}$	15 mins. 20 do. 25 do.	Drowsy; eyelids droopy, a little unsteady. Tremulous, jerky, drunken, eyelids drooping. Dead.	Death in cases it was too rapid for intestinal haemorrhages to take place.	25 mins.
II. 22-12-94.	3 lbs. 5 oz.	Antidotal.	Krait Poison. Liq. Strych. B.P. Liq. Strych. B.P. Liq. Strych. B.P.	gr. $\frac{1}{2}$ m $\frac{1}{2}$ m $\frac{1}{2}$ m $\frac{1}{2}$	20 mins. 24 do. 33 do. 37 do. 39 do. P. M.	Eyelids droopy, lively. Made a fuss over injection. Jerky at once. Is jerkiness due to strychnine or Krait poison? Dying. Dead. The usual cedema with some injection at the site of wound. The same appearances as in cases iii and iv, but the kidneys are congested also.	...	39 mins.
III. 22-12-94.	2 lbs. 6 oz.	Krait Control.	Krait Poison.	gr. $\frac{1}{10}$	29 mins. 34 do. 39 do. 46 do. P. M.	Well. Drowsy, eyelids droopy. Eyelids drooping, drunken, rolling about in pain. Twitching. Dead. At site of injection wound gelatinous cedema. Right side of heart and veins distended. Liver full of blood. Stomach loaded with food.	...	46 mins.

Experiments on Monkeys—(continued).

Experiments on Monkeys—(continued)

Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
IV. 22-12-94.	3 lbs. 7 oz.	Antidotal.	Krait Poison.	gr. $\frac{1}{10}$	26 mins. 31 do. 36 do. 42 do. 43 do. 45 do. 48 do. P. M.	Eyelids droopy. Eyelids droopy, quiet, ill. Very ill at time of injection. Dying. tetanic twitches at short intervals. Strong tetanic twitches at short intervals. All but dead, pupils dilated. Dead. Gelatinous exudate of wound; right side of heart and large veins loaded with blood. Liver ditto. Bladder empty in both this and the last case.	...	48 mins.
V. 9-1-95.	4 lbs.	Krait Conc., Krait Poison.	Krait Poison.	gr. $\frac{1}{4}$	35 mins. 55 do. 1 hr. 25 do. 1 do. 10 do. 1 do. 45 do. 2 do. 20 do. 3 do. 45 do.	Very well Eyelids a little droopy, very vicious still, pupils natural. Very droopy, still lively. More quiet, a little drunken, no salivation. Chewing, seems as if he had something in his mouth that he wants to get rid of. Drooping excessive. Drunk, meditative. Drooping drowsily, leaning on a bar, head on hands; when disturbed, movements convulsive, and inco-ordinate.	...	
VI. 9-1-95.	4 lbs. 6 oz.	Antidotal.	Krait Poison.	gr. $\frac{1}{8}$	3 hrs. 3 hrs. 15 mins. 4 hrs. 20 do. 4 do. 40 do.	Weak, inco-ordinate, almost limp; can't stand falls on all fours when lifted. In statu quo In statu quo, but more feeble. Just alive. Found dead.	...	4 hrs. 40 mins.
			Krait Poison.	gr. $\frac{1}{8}$	40 mins. 55 do. 1 hr. 30 do. 1 do. 45 do. 1 do. 52 do. 1 do. 57 do. 2 hrs. 20 do.	Very well. Very vicious, no drooping of eyelids, pupils natural. Eyelids beginning to droop, very lively. More quiet, droopy, no salivation. Chewing movements. Jerky to aural stimuli; no lessening of droopiness. Has got much worse since 1st injection of strychnine was given; is still jumpy, but semi-drunken and less active.		
			Liq. Strych. B.P.	m $\frac{1}{4}$	2 do. 25 do. 2 do. 50 do.	Very poorly jumps to touch. Drooping drowsily, leaning on a bar, head on hands, jumps to touch, can't stand, convulsive inco-ordinate.		
			Liq. Strych. B.P.	m $\frac{1}{4}$	3 do. 5 do. 3 do. 10 do. 3 do. 20 do. 3 do. 35 do. 4 do. 5 do. 4 do. 25 do. 4 do. 40 do.	Still twitching to touch, but limp and moribund, can't be roused. No response to stimulus. Moribund, jerks to touch. In statu quo. Just alive, twitches on touch. Just alive. Found dead.		4 hrs. 40 mins.

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Krait Poison and Strychnine. Experiments on Dogs.

Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Infection.	Loss of Infection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
VII.								
15 12 94.	14 lbs (dog).	Krait Control	Krait Poison.					
					43 min.	Well at time of injection.		
					48 do.	Vomited food and mucus. Starts if touched and passes into tremor which lasts some time.		
					56 do.	Prostrated and tremulous.		
				1 hr 0 do.		Head on ground. Can't stand. Very ill and very tremulous.		
				1 do 8 do		Lying down. Hard to move.		
				1 do 24 do		Convulsed. Spasms severe and all four legs spread out and paralyzed.		
				1 do 31 do		By 10. A. M. entirely unconscious. Mouth full of blood, and eyes protruding.		
				1 do 38 do		Dead.		
				P. M. 1 do		Post-mortem: Right side of heart congested. Ventricle greatly distended. Aorta congested. Lungs congested. Spleen congested. Stomach congested, contains no blood. Intestines congested, and containing a stinking grumous fluid. Subcutaneous hemorrhages occur along the small intestine.		

VIII. 15-12-04.	10 lbs. (bitch)	Antidotal.	Krait Poison.	$\frac{3}{4}$ lbs of contents of above gland. <i>m</i> 1	35 mins. 55 do. 1 hr. 0 do. 1 do. 1 do	Well at time of injection. No symptoms up to date. Tremulous and jumpy, seems ill. Retching, but brought up nothing. Can stand but is tremulous.	The dose was smaller than in the previ- ous case and symptoms of Snake poison- ing were later in appearing.
			Liq. Strychnia B. P. Strychnia Liq. Strychnia B. P.	<i>m</i> $\frac{1}{2}$	1 do. 8 do. 1 do. 8 $\frac{1}{2}$ do. 1 do. 9 do. 1 do. 12 do. 1 do. 15 do. 1 do. 20 do. P. M. at once.	Is uneasy, Eyes bright. Strychnine convulsions. Convulsions at the slightest noise. Passed urine. Dying. Dead. Chest, Right Heart and Venous system gorged. Lungs congested. Abdomen. Liver, Kidneys and Spleen, congested. Intestines, contained no blood; a few scattered hemorrhages were found beneath the mucous membrane in the small and large guts. Stomach, much congested, contained no blood. Bladder, much congested. Injection around, marked by blood stain- ed jelly-like extravasation.	After strych- nine was given, the animal rapid- ly got worse and died be- fore the other.
IX. 14.11.04.	...	Krait Con- trol.	Krait Poison.	The contents of one gland of a Krait measuring about 12 drops, were equally divided between the gutter-pills in experiments IX & X	10 mins. 13 do. 29 do. 35 do. 36 do. 39 do. P. M.	When lifted, a tremor passed over the animal, legs chiefly affected, cheap. A similar tremor. Seemed to have some difficulty in swallowing saliva. Deep, slow, gasping respiration: can't stand. Slight convulsion, lying on side. Dead No subcutaneous extravasation found. bladder full of turbid yellow urine not blood stained, no vaginal haemorrhage.	...

Krait Poison and Strychnine. Experiments on Guinea Pigs.

Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Remarks.	Time elapsed between 1st Injection and Death.
X. 14.11.94.		Antidotal.	Krait Poison	Sec. experiment as above. in 4	10 mins.	When lifted a tremor passed over the animal, legs chiefly affected, decidedly ill.	29 mins.
					13 mins.	A similar tremor.	
					17 do.	Spontaneous tremor; jumps when touched or at a sound; lying semi-prone.	
					19 do.	Well strychnised, lying cheap and prone.	
					25 do.	Dead. No salivation noted throughout. Noticed a bloody discharge from the vulva, which was not present before inoculation, uterine organs highly congested, bladder full of turbid yellow urine (not bloody), very little extravasation around wound.	
			Liq. Strych B.P.		29 do. P. M.		

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Appendix I. B.

Daboia Poison and Strychnine. Experiments on Monkeys.

Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Remarks.	Time elapsed between 1st Injection and Death.
I. 8-12-94	4 lbs.	Control Daboia.	Daboia poison.		20 mins.	Animal healthy; pupils natural.	2 hrs. 40 mins.
					22 do.	Eyelids drooping; Lying down, ill. Giddy, seems drunk, marked drooping of eyelids.	
					25 do.	Very drunken, falling about, head on chest, face getting blue.	
					31 do.	Lying down flat, very difficult to rouse, seems paralysed, no salivation.	
					45 do.	Tremulous convulsion, very blue in the face, a little more active.	
II. 8-12-94.	4 lbs.	Antidotal.	Daboia poison.		57 do.	Lying on face, paralysed, pupil not dilated, seems dying.	
					2 hrs. 40 do.	Dead.	
					Post Mortem.	Liver, spleen and kidneys congested, lungs ecchymosed on surface, stomach full of food, small gut full of bloody chyle in its upper half, submucous ecchymoses abundant at this part, bladder normal.	
					17 mins.	Very fierce and angry, pupils natural.	
					22 do.	Becoming ill. Giddy, lying down, drunken, eyelids drooping, head falling on chest.	
			Liq. Strych. B. P.		26 do.	More lively but can't raise lids, still seems drunk.	
					81 do.		

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Experiments on Monkeys.

<i>Daboia Poison and Strychnine.</i>				<i>Experiments on Monkeys.</i>	
Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.
II. (continued.)					
III. 8-12-94.	2½ lbs.	Control Daboia.	Daboia poison.	33 mins.	Worse again, lying flat, dusky.
				34 do.	Strychnine tremor.
IV. 8-12-94.	2½ lbs.	Antidotal.	Daboia poison.	36 do.	Tetanic spasms on touch.
				36½ do.	Severe opisthotonic convulsions.
				38 do.	Do.
				42 do.	Strychnisation passed off.
				47 do.	Is practically dead.
				54 do.	Not yet dead.
				1 hr. 12 do.	Found dead.
				Post Mortem.	Viscera somewhat congested, a few spots of ecchymosis in large gut.
				10 mins.	Well at time of injection.
				11 do.	Preliminary drunkenness.
V. 8-12-94.	2½ lbs.	Antidotal.	Daboia poison.	12 do.	Stretched out flat with tonic spasms.
				16 do.	Dusky, eyelids drooping.
				16 do.	Sitting up, eyes shut, head drooping.
				19 do.	Lying quiet, eyes shut.
				20 do.	Prone, can't be roused.
				1 hr.	When roused, sits up for a few minutes, quickly falls again.
				3 hrs. 20 do.	Dead.
				9 mins.	Spasms, bad colour, drunken.
				10 do.	Head drooping, did not notice injection.
				13 do.	More lively, sitting up, eyes half shut, head drooping.
VI. 8-12-94.	2½ lbs.	Antidotal.	Daboia poison.	22 do.	Strychnine convulsions.
				23 do.	Several convulsions.
				35 do.	Strychnisation passed off, animal weak and dusky.
				36 do.	Is half dead.
				55 do.	Dead.

Daboia Poison and Strychnine. Experiments on Dogs.

<i>Daboia Poison and Strychnine. Experiments on Dogs.</i>					
V. 1-12-94.	12lbs. ±	Control Daboia.	Daboia poison.	gr. $\frac{1}{8}$	Well, pupils natural. Quiet. Very drowsy the last few minutes. 30 do. Quiet, lying down, no salivation, pupils normal. 50 do. Still quiet and disinclined to move, but can be roused, pupils not dilated. 4 hrs. Seems better. 6 do. Seems well, a natural motion. 8 do. Seems very well, eats and is happy. 24 do. Has remained perfectly well since last note. One week.
					A bitch. ...
					Recovered.
VI. 1-12-94.	12lbs.	Antidotal.	Daboia Poison.	gr. $\frac{1}{8}$	Well, pupils natural. Quiet. Lying very quiet, no salivation, pupils normal. 1 hr. Defaecated, sleepy, no marked symptoms. 1 do. 45 Very drowsy, can be roused with difficulty, no salivation or paralysis. 3 do. 20 did not seem to feel the prick of the needle. 3 do. 27 Slightly jumpy. 3 do. 37 Has been well under strychnine the last few minutes. 3 do. 52 Severely strychnised. 3 do. 57 Still severely strychnised, pupils not dilated, salivation. 6 do. 15 Very ill, retching, trying to vomit, can still walk, did not notice prick. 6 do. 45 Strongly strychnised. 7 do. 30 Trying to vomit, lying on one side, seems dying, no evidence of strychnisation. 7 do. 35 Felt the prick, and jumped. 7 do. 50 Well strychnised.
			Liq. Strych. B. P.	m ii	This experiment was done side by side with experiment V. A bitch.
			Liq. Strych. B. P.	m ii	
			Liq. Strych. B. P.	m ii	

This experiment was done side by side with experiment V.

A bitch.

Dabona Poison and Strychnine. Experiments on Dogs.

Reference No. of Experiments.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
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VI.
(continued.)

7 hrs. 55 mins. Dead.
Post Mortem. Stomach. Patchily congested and containing a melanic semi-fluid mass, about oz. ii. in bulk.
Intestines. At intervals one finds congested circular patches, over each of these a little blood is extravasated, the blood either adheres to the congested spot or else lies close to it.
Beyond these patches, the bowel contains no blood.
Liver. Marked congestion of lobules.
Kidneys. Congested, stellate veins very marked.
Bladder. Contracted and congested.
Tongue. Ecchymosed.
Wound caused by injection. There is a very extensive extravasation of dark red jelly like material around the wound, this extravasation stretches up from the thigh along the wall of the abdomen.

A dog.

VII. 1-12-94.	14 lbs.	Control Dabona.	Dabona Poison.	gr. i	14 mins. 64 do.	Very vicious and lively. Quiet and drowsy. Quiet but not drowsy, walking about.		
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VII.
(continued.)

7 do. 30 do.
9 do.
9 do. 30 do.
11 do. 30 do.
Post Mortem.
(8 hrs. after death.)
11 hrs. 30 mins.

Ill, lying on one side.
Quite unconscious, was yelping a few minutes ago, has passed copious, offensive, melanic stool, evidently dying, has also been bleeding from the mouth.
Practically dead, pupil reflex still present.
Dead.
Tongue. Ecchymosed, probably from bites.
Stomach. Healthy, full of food, no blood present.
Duodenum. Healthy, contains bile.
The lower half of jejunum, the ileum and the large gut all present circular congested patches, these are more abundant than those found in case VI. As one descends the gut one finds an increase in the amount of blood present; the termination of the large gut being full of melanic fluid.
Kidneys. Normal.
Bladder. Normal, contracted.
Liver. Slight lobular congestion.
Spleen. Normal.

VIII. 1 12-94.	12 lbs	Antidotal.	Dabona Poison.	gr. 2	6 mins.	Well at time, pupils natural.		
			Liq Strych. R.P.	m ii	12 do. 22 do.	Ill, drowsy, salivating. B. O. passed urine. Standing up, respiration free, salivating freely, pupils not dilated. Strychnisation commencing, seems as if standing on hot bricks, jumpy to touch.		

Dabois Poison and Strychnine. Experiments on Dogs.					
Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.
VIII. (continued.)			Liq. Strych. B. P.	m i	32 mins.
					Did not notice prick, seeing much the same, salivation has ceased, jumpy.
					Severe opisthotonic convulsion.
					Another convulsion.
					In state of strychnine drowsiness.
			Liq. Strych. B. P.	m i	38 do.
					43 do.
					53 do.
					Lying prone, very ill, half dead.
					Dying but still strychnised
				1 hr. 2 do.	Dead.
				1 do. 7 do.	Some subcutaneous extravasation around wound.
				Post Mortem.	
					1 hr. 7 mins.

Dabois Poison and Strychnine. Experiments on Guinea Pigs.					
Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.
IX. Oct. 1894.		Control Dabois.	Dabois Poison.		28 mins.
					Very quiet.
					Dusky, ill.
					Lies on one side, occasional convulsion of the limbs, some opisthotonus.
					breathing laboured, pupils not dilated.
				38 do.	Better, sitting up.
				5 do.	Convulsions, sitting half up, but weak.
				1 hr. 5 do.	Convulsions, sitting slowly, can't stand.
				1 do. 7 do.	at intervals has spasmodic strychnine-like jerks.
					Much worse, still spasmodic.
				1 do. 13 do.	Dying.
				1 do. 15 do.	Dead.
				1 do. 16 do.	Heart beating long after death, especially its right side, no hæmaturia, no visceral congestion, extensive injection around wound permeating all the layers of the abdomen.
				Post mortem.	
					1 hr. 16

Dabois Poison and Strychnine. Experiments on Dogs.					
Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.
X. Oct. 1894.		Antidotal.	Dabois Poison.		27 mins.
					Very quiet.
					Ill and dusky.
					Respiration rapid.
					Very slack, lies almost on its belly.
			Liq. Strych B. P.	m i	42 do.
					Lying on one side, hind limbs weak, breathing slow and laboured.
					Convulsion of arms and legs.
					Respiration slow and gasping.
					Dying.
				1 hr. 2 do.	Dead.
				1 do. 3 do.	Appearance as in previous case, but extravasation less extensive.
				1 do. 4 do.	
				1 do. 5 do.	
				Post mortem.	
XI. Oct. 1894.		Antidotal.	Dabois poison.		25 mins.
					Well at time of injection.
					Urinated.
					Very quiet.
					Cheap and dusky.
			Liq. Strych B. P.	m i	40 do.
					A Convulsion.
					Starts occasionally. Has urinated.
					No further signs of strychnine or snake poison.
					Twitches when touched.
			Liq. Strych B. P.	m i	1 do. 38 do.
					Convulsion when touched.
					do. do.
					Limbs too weak to support body, settling down on its belly.
					Twitches when touched.
			Liq. Strych B. P.	m i	2 do. 35 do.
					Twitches violently when touched, no improvement.
					2 do. 40 do.
					Prone. Body and limbs convulsed.
					Convulsions.
			Liq. Strych B. P.	m i	2 do. 43 do.
					Twitches when touched.
					Practically dead.
					Twitches feebly when touched. No improvement.
					3 do. 8 do.
			Liq. Strych B. P.	m i	3 do. 13 do.

Very late in first showing symptoms of poisoning. Reason of delay unknown.

Daboia Poison and Strychnine. Experiments on Guinea-pigs.

Reference No. of Experiment.	Weight of Animal.	Nature of Experiment.	Nature of Injection.	Dose of Injection.	Time elapsed since 1st Injection.	Symptoms, etc., noted.	Remarks.	Time elapsed between 1st Injection and Death.
XII.		Antidotal.	Daboia poison.	See experiment IX above.	8 hrs. 45 mins. 3 do. 47 do. Post mortem.	Slight convulsion. Twitches on touch. Dead. As in case IX, infiltration very marked.	Strychnine was given too late and the Experiment was practically a Control Daboia Experiment.	9 hrs. 47 mins.
					30 mins. 40 do. 45 do.	Well at time of injection. Very quiet. Cheap and dusky. Jerks occasionally as if under strychnine, otherwise very quiet. Respiration rapid, each respiration shakes the whole body and is attended with a little squeak.		
					1 hr. 15 do. 1 do. 25 do. 1 do. 27 1/2 do. 1 do. 30 do.	No increased dilatation of pupils. Breathing more quietly, no noise. Very weak in hind legs. Convulsion. On one side. Convulsions continue. Dead.		

1 hr. 30 mins.

Appendix II.

29

An Analysis of Recorded cases in which Strychnine has been used as an Antidote for Snake bite, continued from previous paper read before this Branch.

No. of case.	Reported		Identification of the Snake.	Local signs.	Symptoms.			Interval between Bite and		Result.	Treatment		REMARKS.
	By	In			Refferible to Snake-bite.	Refferible to Strychnisation.	Refferible to other causes.	(A) Commencement of Strychnia treatment.	(B) Recovery or death.		By Strychnine.	By other means.	
48	T. A. Maun- kam Pillay. C. M. S. U- nderpet, S. Arcot.	I. M. Record, 16th Decem- ber 1894.	Snake seen by three natives.	2 punctures on left great toe.	None.	None.	Body cold and bathed in sweat. Cornea insensitive. Pulse imperceptible at wrist. Heart's action very feeble. Sphincterani relaxed. Swollen foot 2 days later.	1 hour.	3 hours.	Recov- ery.	gr. 1/2 in 1 1/2 hours.	...	* All accounted for by fear. Male set. 10.
49	Do.	Do.	Snake killed by another person and thrown away.	2 punctures on back of right foot above heel. No bleeding.	None.	Pricking pain in stomach and feeling of tightness there.	Inability to stand. Restlessness. Coldness of body surface. Heaviness of head. Oppression about chest. Incoherence.	1 1/2 hours.	...	Recov- ery.	1/2 gr. in 1 hour.	Ligature above knee.	Male set. 12. Symptoms do not point to snake bite. Fear and alcohol are more probably responsible.
50	Do.	Do.	Snake seen by the patient.	4 punctures on dorsum of left foot. No bleeding.	...	Constriction and pain of the throat. Difficulty of swallowing. Feeling of tightness within the chest. Difficulty of breathing. Sense of rigidity of whole body.	Coma.* Pulselessness. Feeble heart-action.	2 hours.	8 hours.	Recov- ery.	1/2 gr. in 35 mins.	Native Drugs.	Male set. 24.
51	2nd class Hpl. Asst. C. Admanabha Navadoo, Tirupponor, 2nd Novem- ber 1894.	Comm. to Surg.-Genl. c. Govt. of Madras by Surg.-Maj. H. Nailer. M.B. Ching- leput, on 24th Janu- ary 1895.	No snake seen.	Scratch on 2nd toe of right foot.	Pain in foot. Oppression at chest. Drowsiness passing into unconscious- ness. Drooping of eyelids. Giddiness. Loss of vision. Affection of speech. Breathing slow.	Convulsions.	Nil.	1 hour.	2 hours.	Death.	24 gr. in 1/2 hour of which .05 was given by mouth and .19 Subcutane- ously.	Nil.	The convulsions are stated by the re- corder to have been undoubtedly due to Strychnine. No improvement fol- lowed the use of the drug. Classical signs of snake bite were pre- sent. The ligature was omit- ted.

An Analysis of the recorded cases in which Strychnine has been used as an Antidote for Snake-bite, continued from previous paper read before this Branch.

No. of Cases.	Reported.		Identification of the Snake.	Local signs.	Symptoms.			Interval between bite and		Result.	Treatment.		Remarks.
	By	In			Refferible to Snake-bite.	Refferible to Strychnisation.	Refferible to other causes.	(A) Commence-ment of Strych ne Treatment.	(B) Re-covery or Death.		By Strychnine.	By other means.	
52	Asst. Surg. Baldeo Singh and Surg. Capt. G. H. Baker, I.M.S. Bandatt, N.W.P.	I. M. G., Dec. 1894.	Cobra properly identified.	Puncture of one fang, one inch from cleft bet. ween 1st and 2nd toe of right foot. Tissues around, livid and swollen. Swelling of foot remained for some days.	Giddiness. Inco-ordination. Salivation. Nasal voice. Ptosis of Right eye. Vomiting. Inability to swallow.	Convulsions after 43 gr. of nitrate of Strychnia in 5 hrs.	Nil.	1½ hours.	8 hrs.	Recov-ery.	43 gr. in 5 hours.	Native appli-cations. Ligature In-cision cup-ing.	Adult male. N.B.—(1) F snake char (2) The glass same side perfect f empty. Snake-men empty the fore remo fang. The other f hors de con (3) Cobra o long and grown. (4) Strychn given and ent recover the notes post hoc more strong 'proper ho
53	Chas. A. Lafrenais, Ag. Civil Surgeon, Tellicherry.	Official letter to Surg. Genl., c. Govt of Madras, dated 2nd Feb. 1895.	Not identified. Symptoms point to Echis.	Bitten on left heel. Left leg swollen. Two punctures on heel.	Face puffy. Eyes injected. Colapsed. Bloody urine.	...	...	1½ days.	1 hour after commen-cement of stry-chnine treat-ment.	Death.	15 gr.	Native treatment. stimulants.	Probably Ech Strychnine good. ? Did it cause
54 55 56	Surg.-Lt. Col. Joshua Duke.	A paper read before the I.M. Congress, Dec. 1894.	(1) Dr. Duke is doubtful whether the Snake was poisonous.	...	...	...	...	...	...	Recov-ery in all three.	(1) ½ gr. (2) ½ gr. (3) ½ gr.	...	...
57 58 59	Do	do	(4) Snake not identified.	...	...	(6) Symptoms severe Fre-quent convul-sions.	...	...	...	Recov-ery in all.	(4) ½ gr. (5) ½ gr. (6) ½ gr.	...	* These s) suggest sti-tion but n poison.
60	Do	do	(7) Snake not iden-tified.	...	None cited.	None.	Moribund on admis-sion.	4 hrs.	5 hrs.	Death.	(7) ½ gr.	...	...

An Analysis of the recorded cases in which Strychnine has been used as an Antidote for Snake-bite, continued from previous paper read before this Branch.

Reported		Identification of the Snake.	Local Signs.	Symptoms.	Referred to Strychnisation.	Referred to other Causes.	Interval between		Result.	Treatment		REMARKS.
By	In						(A) Bite and commencement of Strychnia treatment.	(B) and cover de		By Strychnine.	By other means.	
61	Surg.-Lieut. Col. Joshua Duke.	A paper read before the I.M. Congress Dec. 1894.	5) Snake 'said to be a cobra.'	Bitten on finger. Finger bleeding.	Drowsiness. Pain in back. Labour unprogressive.	...	...	...	Death.	(8) $\frac{1}{2}$ gr.	Ligature not used.	...
62	Do	do	(9) Snake seen.	(10) Bitten on ear. " " leg.	Marked on admission.	...	...	(9) 1 hr. (10) 2 hrs.	Death.	(9) } (10) }	...	...
63	Do	do	(11) Not identified.	...	Marked on admission.	...	...	1 hr.	Death.	?	Ligature.	Child wt. 5.
64	Do	do	(12) Snake killed "a tree."	(13) Bitten on lower arm.	...	'No notice of tetanic spasm.'	...	3 hrs. +	Death.	(12) $1\frac{1}{2}$ gr.	Ligature & free incision.	A sepoy.
65	Do	do	(14) Snake not identified.	...	...	Convulsed 15 min after bite.	...	...	Recov-ery.	(13) $\frac{1}{10}$ gr.	...	...
66	Do	do	(15) Grass green Snake.	...	...	...	...	...	...	...	...	§ Most probably Eryophis mycterizans, a harmless treesnake
67	Do	do	(16) "Attributed to the bite of a * Daboia Russellii."	Agonising local pain and swelling of limb.	Never insensible.	...	...	...	Death.	(15) $\frac{1}{10}$ gr.	...	Miscarriage and death on 3rd day * Snake probably an Echis.
68	Do	do	(17) Do	Local swelling and excessive pain.	Conscious to nearly the last. Suddenly became insensible and died.	...	...	Few minutes.	Death.	(16) $\frac{1}{10}$ gr.	...	...
69	Do	do	(17) Do	Bitten on ankle. Local swelling and pain.	...	...	...	7 days.	Death.	(17) ? dose.	...	Labour set in on 7th day and the woman died.

N. B. — The figures in brackets [thus (17)] refer to the numbers of these cases in Dr. Duke's original tables appended to his address before the Indian Medical Congress.

An Analysis of the recorded cases, in which Strychnine has been used as an Antidote for Snake-bite, continued from previous paper read before this Branch.

No. of Cases.	Reported.		Identification of the Snake.	Local signs.	Symptoms.			Interval between bite and		Result.	Treatment.		REMARKS.
	By	In			Refrerrable to Snake-bite.	Refrerrable to Strychnisation.	Refrerrable to other causes.	(A) Commencement of Strychnine Treatment.	(B) Recovery or Death.		By Strychnine.	By other means.	
71	O. W. Jones, M.D., Civil Surgeon, Wund District.	I.M. Gazette, November 1891.	Cobra, identified by patient, a snake charmer.	Two punctures on right thumb.	Salivation, ptosis; indistinctness of speech. Staggering gait; dimness of vision; drowsiness passing into complete insensibility.	...	...	3½ hrs.	4½ hrs.	Death.	1.35 grs. in ½ hr.	Punctures enlarged and Potassium Permanganate rubbed in.	An undoubted case of snake-poisoning in which large doses of strychnine were given, without benefit to the patient.
72	Do	Do	* Snake not caught, said to have been seen by native woman, attributed to Bungarus Caruleus, and described as Viper bite.	4 minute indistinct punctured wounds on right little toe.	Nil	Nil	Slight convulsive fit 15 mins. after bite, followed by dizziness, vomiting and dimness of sight; profuse perspiration of body; slight bleeding from mucous membrane of mouth; puffiness of face; congestion of both eyes; "right lower extremity felt paralysed"; dryness of throat.	1½ hrs.	3½ hrs.	Recovery.	15 gr. in ½ hr.	Nil.	*(a) The Krait is not a viper, and does not possess viperine teeth; therefore would not inflict the wound described. (b) The snake was only seen by a native woman. (c) All the symptoms exhibited may be safely ascribed to fright. Patient female, æt. 13.
73	Surg.-Lt.-Col. H. Hyde of Cuddalore, case was treated by Civil Apoth. P. Muthusawmy.	Communicated officially to the Surg.-Genl. of Govt. of Madras.	Seen by the Apothecary and described as Panaya Viryan.	2 small punctures on left ear, covered with blood.	Drowsiness; Loss of power over the extremities. Respiration slow and sobbing. Pulse feeble. Pupils slightly dilated.	Twitches due to Strychnine.	Conjunctiva irritated by native medicine.	12 hrs.	Less than 13 hrs.	Death.	23 gr. in 50 minutes.	Patient was bled and dosed by Practitioners.	§ These symptoms might have been produced by the rativetreatment adopted and are not pathognomonic of snake bite. The recorder believes the death of the patient may have been hastened by the Strychnine.

APPENDIX III.

Experiments on the effect of Snake poison administered by the mouth.

Date.	REMARKS.
January 5th, 1895.	A big Pie-dog ate some meat into which had been injected the contents of one gland of a large healthy Daboia. The poison had been kept about a month, but experiments with the contents of the other gland of the same snake, showed that it was still very deadly when subcutaneously injected. Later.—The dog was none the worse for his meal and lived till January 16th, when he was bitten by a Daboia and died within 2 hours of the bite.
January 9th.	A Pie-bitch was given the contents of one gland of a Daboia on meat, and also the gland itself. Two or three drops of poison had been expressed from the gland, this being fully as much as another Daboia injected through a hole in a vigorous bite. The poison was soaked up on the meat. The dog ate both meat and gland. At first she was evidently suspicious and preferred fresh pieces of meat, but greed and persuasion prevailed in the end and the poisonous matter was fairly swallowed. Later.—The animal is still alive on January 16th, and has never showed any signs of ill-effects from the dose.
January 16th.	The poison was extracted from the glands of 2 large Daboias by some snakemen in my presence. They obtained some poison by making one snake bite over a leaf into a glass section-dish. The remainder they squeezed out with their thumbs into the mouths of the reptiles and then soaked the poison up on pieces of meat. The poison thus extracted was given on meat to a large pie-dog which ate it up greedily, and has never seemed in any way the worse for the dose. The dog is as well as ever it was.
January 18th.	About ½ grain of dried cobra poison was given to a white pariah dog at 2 P.M. The poison was dissolved in a little water and soaked up with meat, which the dog ate. The dog showed no signs of poisoning, remaining as vigorous as ever. It made so much noise, on account of the unaccustomed restraint that it was let loose at 7 P.M., 5 hours after taking the poison. It immediately ran off as vigorous and well as possible.

Experiments on the effect of Snake poison administered by the mouth.

Reference No. of Experiment.	Date.	REMARKS.
(5)	February 2nd, 4 P.M.	A Daboia, 3 feet 9 inches long, was brought in by a native freshly killed. Its glands were dissected out and found to contain an unusually large amount of poison. They were emptied and the poison was sopped up on meat and bread and given to a strong Pie-dog. The animal ate the food and afterwards the glands which were sandwiched inside a piece of bread.
	9-30 P.M. February 9th.	Dog has remained well. Dog has remained well throughout.
(6)	February 9th 3 P.M.	Same dog as in last experiment, ate 10 drops of cobra poison on meat and bread. The poison was extracted from a freshly-killed cobra, 3 feet 9 inches long, the glands being also given.
	12th	The dog therefore ate about one grain of fresh cobra poison, enough in fact to kill 10 dogs if it had been subcutaneously injected. From beginning to end the dog had never a symptom of cobra poisoning.
(7)	February 12th.	Six drops of cobra poison which had been extracted from a large cobra on February 11th were given on meat to a Pie-bitch. She ate the meat greedily.
	14th.	Bitch has in no way suffered from her meal of poison.
(8)	February 27th, 1895, 7-50 A.M.	10 drops of cobra poison removed from a vigorous cobra on 11th February 1895, were dissolved in water and stirred up thoroughly with some meal which was then given to two ducks.
	February 27th, 8 A.M.	The ducks greedily cleaned the tin, but suffered in no way from their meal. The cobra poison would have weighed over a grain.
(9)	February 27th, 8 A.M.	The contents of the left gland of a large cobra were dissolved in water and thoroughly mixed with a handful of rice which was then greedily eaten by two fowls.
	February 27th, 11 A.M.	The poison had been removed from the snake on 16th February 1895, and measured sixteen drops (about gr. ii). The fowls were none the worse for their meal.
(10)	February 27th, 8 P.M.	Twenty-one (21) drops of poison were removed from the right gland of a large cobra on 16th February 1895, and were to-day dissolved in water and mixed with some leaves from a hedge.
	28th, 12 noon.	A goat ate nearly all these leaves to-day, and is none the worse for his meal. The rest of the leaves have been eaten by the animal.

Experiments on the effect of Snake poison administered by the mouth.

Reference No. of Experiment.	Date.	REMARKS.
(11)	February 28th, 8-15 A.M.	The same goat as in last experiment has just eaten some leaves which have been wet with a solution of Daboia poison. The poison when extracted on 16th February 1895 measured 71 drops. The animal disliked the poison-covered leaves and had to be made forcibly to eat them, but the whole of the poison was eventually got down.
	11-15 A.M. March 6th.	Goat none the worse for the poison. Goat alive and well.
(12)	March 28th, 1895 4-45 P.M.	The glands were extracted from a freshly killed Daboia 41 inches long. Eight drops of poison were expressed from the two glands, this was at once soaked up on bread, and both poison and glands were then eaten by a goat (the same animal as in experiment 11).
	March 21st, 1895.	The goat has been in no way ill from its meal.
(13)	March 20th, 1895 3-15 P.M.	The poison glands were removed from a freshly killed Krait (Bungarus caeruleus) measuring 37 inches in length. 9 drops of poison were expressed from the two glands and immediately sopped up on pieces of meat and bread. Both the glands and the poison were eaten by a pie bitch.
	March 21st, 1895	Dog has been perfectly well, and has shown no symptom of poisoning.

APPENDIX IV.

Some records of cases in which animals were bitten experimentally by snakes.

CASE I. (Recovery).

Jany. 8th ... A large pie-dog was bitten in the fold of the hind leg by a vigorous Daboia, 3 feet 8 inches in length.

1-25 P.M. ... The dog walked over the snake in search of some food that had been thrown near the reptile's head. The Daboia seized the dog and shook it, nor did it let go till the dog had bolted several yards squealing loudly. Teeth marks seen.

2-0 P.M. ... Licks bite occasionally, otherwise well.

2-20 P.M. ... Has been uneasy the last 10 minutes. Licks wound often.

2-50 P.M. ... Dog is cheap but stands. Part hot and tender.

3-45 P.M. ... Seems fairly well.

5-5 P.M. ... Seems well; there is marked staining at the seat of the bite which is tender.

Jany. 9th, ... 10-0 A.M. ... Alive and well; two teeth marks are seen as white marks which look as if the spots had been touched with chloride of zinc stick; around these marks there is a purple stained area obviously the result of subcutaneous extravasation.

13th ... The staining has gradually faded and is now greenish yellow in colour and becoming indistinct, there is but little tenderness left now. Animal quite well.

The dog was seen by Surg.-Lieut.-Col. Browne and Surg.-Captains Williams and Giffard.

CASE II. (Death).

Jany. 16th ... 11-30 A.M. ... The same dog as in the previous experiment was fairly bitten by a vicious Daboia, about 3 feet 4 inches long. The dog had nearly walked over the snake in search of food. The bite was so quickly given that one could hardly see what had happened. The dog rushed off yelling furiously with blood flowing from the right foreleg just above the foot, and lay down in a corner.

11-37 A.M. ... Looks very ill; pupils large; defæcating, quiet, breathing heavily.

11-40 A.M. ... Comatose.

11-43 A.M. ... Violent heavings of abdomen followed by semifluid motion in which there was no blood.

11-45 A.M. ... Pupils contracted to half the diameter they were at first.

12-15 ... No convulsions up to date. In *statu quo*.

12-30 ... A semifluid motion, streaked with blood, forcibly ejected.

12-55 ... Still breathing but practically dead.

1-10 ... Breathing fast and laboured. Pupils dilated. Eyes turned downwards.

1-15 ... Gasping. Just passed about 3ss of dark blood per rectum. A little (blood-tinged) fluid has also escaped from the mouth.

1-20 ... Per rectum about 3ii of frothy melanic fluid.

1-30 ... Do do do do do

1-45 ... Do do do do do

2-0 ... Conjunctive insensitive. Respiration shallow and less frequent.

2-15 ... Dead 2½ hours after the bite. No Post Mortem was made.

Remarks. Of the two bites which this dog received the first seemed the more efficient and the local staining showed poison was injected. The glands of the snake which inflicted the first bite were dissected. Left gland nearly empty but contained some poison. Right gland contained several drops of poison. The fangs of both sides were seen working during life.

CASE III. (Recovery.)

Jany. 10th ... 3-30 1895. ... Pie bitch was bitten on the face and nose by an Echis about 15 inches long which struck three times and drew blood.

3-40 ... Nose swollen. Dog lying down.

3-55 ... Dog very poorly. Pupils moderate.

4-20 ... Swelling of face and head severe. Submaxillary and cervical glands enlarged. No evidence of frontal headache. Pupils natural. Dog can stand, but lies down at once when lifted on to its feet.

4-30 ... Betching.

4-35 ... Tremulous movements affecting trunk and limbs. Bitch very ill.

5-25 ... Face, head and neck hugely swollen. Can't stand, hind legs very weak.

6-30 ... Swelling of head and neck enormous. Pupils large. Very ill. Won't stand.

9-15 ... More lively. Eating with pleasure. Swelling as before.

9-45 ... Seems much better. Pupils natural now.

Jany. 11th ... 7 A.M. ... Swelling less. Cheery, walking about, wagging tail, eating well, and easily.

Jany. 12th ... Swelling subsiding. Dog fairly lively.

Jany. 13th ... Do do do do. No tenderness.

Jany. 14th ... Swelling nearly disappeared.

CASE IV (Recovery.)

Jany. 14th ... 11-30 A.M. ... Same Dog as in case III bitten by a vigorous Echis, 13 inches long on both hind legs. Blood came. Dog did not howl

2 P.M. ... Seems well but can't stand as both hind legs are much swollen and she will not trust them. No glandular enlargement. Pupils natural.

9 P.M. ... Has remained much as in last note. Ate food well.
 Jany. 16th ... Face is a little more swollen. Both legs swollen. The wounds on her face and legs caused by the bites have formed shallow ulcers. She prefers to lie down and is evidently not well.
 Jany. 16th ... Still cheap. Legs and face still a little swollen.
 Jany. 17th ... Swelling subsiding. Better all round.
 Jany. 18th ... Well as ever. No swelling.
 Jany. 19th ... Quite well.

CASE V. (Recovery).

Jany. 19th ... 3 P.M. ... Same dog as in cases III and IV bitten by an Echis on the left hind foot.
 4-45 P.M. ... Slight swelling of left hind leg. Dog rather cheap.
 Jany. 20th ... Swelling slight. Dog well.
 Jany. 22nd ... No signs, local or general. Dog quite well.

CASE VI. (Recovery).

Jany. 14th ... 11-30 A.M. ... Pie bitch severely bitten by an Echis Carinata 13 inches long on the left hind foot. Bitch howled and licked foot.
 11-40 A.M. ... Leg much swollen. Animal cheap.
 2-0 P.M. ... Leg greatly swollen up to the hip. Dog won't trust it and stands on 3 legs. Pupils natural. Tenderness not excessive even at the seat of wound.
 4-0 P.M. ... No marked change.
 7-0 P.M. ... Do do do Pretty fit.
 9-0 P.M. ... Do do do do do. Eats well.
 Jany. 15th ... Seems well. Appetite good, Won't trust leg fully. Great swelling of whole leg. Glands not much enlarged. Two superficial sores over region of the bite. These do not seem painful.
 Jany. 16th ... Very fit. But leg still swollen and untrustworthy.
 Jany. 17th ... Very fit. Swelling subsiding. Leg only slightly tender.
 Jany. 19th ... Well as ever. Swelling disappeared. Ulcers nearly healed.

CASE VII. (Recovery).

Jany. 19th ... 3 P.M. ... Same bitch as in last case bitten on nose and left forefoot by Echis, drawing blood in the nose.
 4-45 P.M. ... Some swelling of left foreleg. Dog fit.
 Jany. 20th ... Very little swelling. Animal quite fit.
 Jany. 22nd ... No signs (local or general) of disease.

CASE VIII (Recovery)

Jany. 19th ... 3 P.M. ... A large well grown Pie dog bitten by an Echis on left foreleg over 1st joint.
 3-5 P.M. ... Local swelling commencing.
 4-45 P.M. ... A good deal of swelling of the whole leg. Dog quite fit.

Jany. 20th ... Swelling well marked. Dog is not well.
 Jany. 22nd ... Still slight swelling locally. No tenderness. Dog well.

CASE IX (Death)

Jany. 16th ... 12-30 P.M. ... A large strong Pie dog was bitten on the belly and on all four feet by 4 Echises. Two of the snakes not merely struck but held on making the dog yelp.
 1 P.M. ... Right fore foot swollen.
 Jany. 17th ... 9 A.M. ... The dog died.
 Post Mortem. ... Extensive subcutaneous red currant-jelly like extravasation over lower surface of the abdomen, over surface of right fore and hind legs, in retroperitoneal space and in anterior and posterior mediastinal spaces. Both pleura contained bloody fluid.
 Lungs.—Show large congested patches.
 Alimentary Canal.—Stomach natural full of blood.
 Small gut.—Upper part natural, bile-stained.
 Lower half of small gut and the large gut show numerous submucous extravasations and contain within them a certain amount of bloody matter.
 Liver.—Slightly congested.
 Kidneys } Natural.
 Spleen }

APPENDIX IV B.

Kindly communicated by Surg.-Major W. BROWNING, I. M. S.

I.

Healthy bitch weighing 30lbs. bitten on the upper and lower lips by a freshly caught Echis 12 inches in length.

Symptoms.—Salivation, hurried respiration, rigors, refused food and water, swelling of lips and down the neck and had a general appearance of illness, recovered.

II

Bitch in poor condition weighing 26lbs. bitten by two freshly caught Echis, respectively 15½ and 10 inches, on the nose, lips, hind leg and toes.

Symptoms.—Salivation, hurried respiration, hair on back standing erect, parts around bites much swollen, animal will not place affected leg on the ground, refuses food and water general appearance of being very ill. This animal had had a litter a month previously and on the morning following the experiment, that was a bloody discharge from the vagina. Recovered.

III.

Healthy dog, weighing 35 lbs. bitten by the larger of the two Echis used in Experiment II, about 10 minutes had elapsed between the two experiments, with the exception of slight swelling, no ill effects were noted in this case.

Summary.—The chief symptoms were considerable swelling and a general appearance of being ill, the symptoms came on within three minutes and with the exception of the swelling all passed off within 12 hours.

APPENDIX V.

A case kindly communicated by Surgeon-Major W. BROWNING, I.M.S.

At 2-15 P.M. on 8th October 1894 a strong young grass-cutter woman set about 25 years was bitten on the palmar surface of the last phalanx of the left thumb while in the act of cutting grass. A companion at the time killed the snake and applied some moistened chunam from her betel bag over the wounded part. The patient came to the Dispensary about 10 minutes after the occurrence. Her companion who had accompanied her was sent to fetch the snake.

Observing two fang marks which had previously bled, these were at once freely laid open and bleeding encouraged by keeping the whole thumb immersed in very hot and strong carbolic lotion which was frequently renewed.

About two hours after her arrival at the Dispensary, the patient complained of a slight pain in the shoulder of the affected side and a dull frontal headache. At 8 P.M. a sharp attack of hæmorrhage occurred from the bitten part, which was controlled with considerable difficulty. At 1 A.M. another slight attack of hæmorrhage came on.

Besides these trivial symptoms no others of an alarming nature shewed themselves. All symptoms of shock were completely absent.

No internal remedies whatever were used.

The snake which bit the woman was an Echis, 10 inches in length.

Fearing that the patient would fall into the hands of quacks she was detained at the dispensary till the morning.

Except for a swollen condition of the thumb the patient left the dispensary perfectly well.

Enclosure No. 4 to Letter No. 273d/28/3/10.

Vol. VI.

October 1895.

No. 4

TRANSACTIONS
OF THE
SOUTH INDIAN BRANCH
OF THE
BRITISH MEDICAL ASSOCIATION.

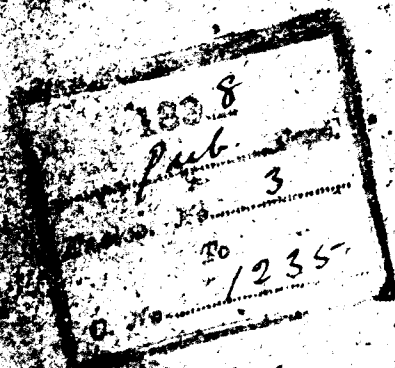
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MADRAS.

PRINTED AT THE LAWRENCE ASYLUM PRESS, MOUNT ROAD.

1895.



Meeting held in the Central Museum, 30th September.
at 5-30 P.M.

SURGEON-MAJOR-GENERAL SIBTHORPE, F.R.C.P.I.,
PRESIDENT, IN THE CHAIR.

The Minutes of the last Meeting having been read and confirmed the business of the evening was proceeded with.

The Advantages of Total Abstinence. By Surgeon-Major G. F. POYNTER, A. M. S.

MR. PRESIDENT AND GENTLEMEN,

When I accepted the task of reading a paper on "The Advantages of Total Abstinence" to members of my own profession (many of whom I feel sure are better able to perform such a task than I am,) I did not altogether realize what it was I had promised to do. On thinking the matter over I could not but see how difficult it was for me to bring this subject,—which has become one of the great questions of the day, entering as it does into our politics as into our everyday life,—to bring this subject, I say, before you in such a manner as I, personally, feel it should be brought before you. Fully persuaded in my own mind that there are very great advantages in total abstinence, I would, as far as in me lies, strive to persuade you also, and, through you, influence for good the many with whom you of necessity come in contact. Now please do not imagine I am here to ask you all to become total abstainers, *nolens volens*, far from it. It is neither my province, nor is it my desire to do so, especially at this time. We have not come together to listen to a temperance lecture, rather I trust we have met as educated professional men to see if there are any advantages in total abstinence either for ourselves, or for our patients; to discuss the subject in all its bearings, as far as possible with unbiassed minds, and to adopt that which we honestly feel may be profitable either for ourselves or for those who desire our opinion professionally. Now I am fully aware it is not, as a rule, a very strong case that requires a negative argument for its proof, but nevertheless it is a

very useful form of argument and one that sometimes carries more weight, and is more likely to convince than a direct argument in favour of the points you wish to prove. I propose, with your leave, to adopt this form of argument at first and endeavour as far as possible to point out some of the disadvantages of drinking Alcohol habitually before drawing your attention to the advantages of total abstinence.

All fermented liquids that are commonly used as beverages contain ethylic alcohol (C_2H_5O) in varying proportions and in consequence the action of these liquids on the human body varies, partly in proportion to the amount of ethylic alcohol that the liquids contain, and partly to the various constituents,—(sometimes normal, sometimes added adulterations) they also contain. These last however are usually small, the chief constituent of all fermented liquids which must claim our attention this afternoon is the alcohol, as it is to this substance that they owe those properties for which they are drunk.

Alcohol is the result of fermentation, and "fermentation," says Liebig, "is nothing else but the putrefaction of a substance containing no nitrogen." Ferment or yeast is a substance in a state of putrefaction the atoms of which are in continual movement. In order to prevent this fermentation turning the liquid into vinegar, the ingenuity of man steps in, and by heat or some other method stops the process at the proper moment. The making of wine has been aptly described as a chemical process, as the albumen in the grape juice unites with the oxygen in the air, and is converted into yeast, this yeast in the vinous fermentation resolves the grape sugar into alcohol and carbonic oxide. Now let us see how this alcohol acts on the human system. If moderately diluted it is a slight irritant to the mucous membrane of the mouth, pharynx and stomach, increased in quantity it has a reflex action on the circulation, and if largely given may cause death "by its action on the heart, bringing about a sudden rise of blood pressure, and arresting the heart in diastole."* It has also in smaller quantities an anæsthetic effect on the nerves of the stomach which will probably account for the fact that it is at times useful in irritable conditions of that organ. Nearly the whole of the alcohol consumed is absorbed by the capillaries of the stomach and carried in the blood

to the liver, where it is in consequence more concentrated than when it has passed through other parts of the body, therefore, we find that its effects on the liver are more marked than on other organs, and we get cirrhosis, enlargement and fatty degeneration of that organ as the result of direct interference with the liver cells, and the peculiar action of alcohol on the connective tissue, which it transforms from a permeable tissue into a dense more or less impermeable tough structure, resembling parchment.

Alcohol, further, has a powerful influence in preventing the absorption of oxygen and the exhalation of carbonic dioxide from the blood. Dr. Prout states "Alcohol in every state and in every quantity uniformly lessens in a greater or less degree the quantity of carbonic acid gas eliminated, according to the quantity and circumstances in which it is taken. When taken on an empty stomach this effect is almost instantaneous, but is probably greatest three hours after taking the alcohol, it must interfere therefore to some extent with the purification of the blood, and check all functions which require oxidation for their performance."

Alcohol increases the contractions of the heart at first, but later there is flagging and weariness due to the extra work it has to accomplish. This may be explained by the paralyzing influence of alcohol on the vaso motor centres, the calibre of the arteries and capillaries is increased and a larger quantity of blood is required to fill them, the heart in consequence has extra work to do pumping up more blood into the enlarged channels.

On the brain and higher nerve centres the physiological action of alcohol is well known, and of great importance. These appear to be paralyzed in inverse order of development. The power of self-control is lost, the muscles which act almost, if not quite, automatically in the ordinary duties of every day life become erratic and the power of co-ordination is lost. Increase the dose, and only the involuntary functions are performed, these in their turn are extinguished to be followed by profound coma and death. This of course is the result of large doses taken in quick succession, but it is necessary for our purpose to see the result of much smaller doses, taken at much longer intervals regularly for a lengthened period. Now small doses taken habitually for years undoubtedly do produce anatomical changes. Some years ago, Dr. Dickenson pointed out

that alcohol "replaces more actively vital materials by fat and fibrous tissue; it substitutes suppuration for new growth, it promotes caseous and earthy change, it helps time to produce the effects of age, and in a word is the *genius of destruction*." In 1891, Dr. Alfred Carpenter writing to the *Times* says, "It is a virulent poison, and as such should be placed in the list with arsenic, mercury and other drugs." These are strong words, but when we study the subject and see how those whose occupation or calling brings them constantly in contact with Alcohol, *e.g.*, cellarmen, inn-keepers, brewers, &c., although they may be strictly moderate drinkers, we realize that alcohol is to them indeed "the genius of destruction," and though it may not itself be the cause of their death, it certainly renders them more liable to contract disease, and less able to fight against it when once prostrate, compared with those who never take alcohol; that is to say, the power of resistance, (possessed by those who drink alcohol habitually,) against morbid action is lessened by the action of the alcohol on the blood and tissues of the body, which as I have before said is due to the power it has of preventing the absorption of oxygen and the exhalation of carbonic oxide. This fact was long ago pointed out by Harley, Schmiedeberg and Prout; it is one of the actions of alcohol which is most universally acknowledged and of the greatest importance, because it shows how some of the tissues of the body cannot be completely oxidised, as they would be in the normal condition of the blood, but must remain in the system instead of being removed as waste products, thus they may become a cause of disease or at any rate have a more or less injurious effect during the course of any illness. Again it has been affirmed by Dogiel that "Ethylic alcohol causes the amoeboid movements of the white blood corpuscles to cease," this with the fact noted above will easily account for the suppurations that are so common amongst those addicted to a too free use of Alcohol, and the difficulties encountered when treating them for disease or injury. If then we acknowledge that Alcohol has these deleterious effects on the body in health, we shall not have much difficulty in seeing that the disadvantage of taking alcohol habitually is proved. It is undoubtedly an advantage to give it as a medicine occasionally, as for instance, when we want to prevent the too rapid oxidation of tissue material, but I am of opinion that it should be used much

more sparingly as a medicine than it is now, though I am glad to say there has been a vast improvement in this respect of late years, certainly it is not prescribed now quite in the same liberal manner it was in former years.

At the Lock Hospital in London some years ago I was informed that a number of selected cases, as far as possible alike were treated in exactly the same way, except that half had alcohol in some form or other, whilst the other half had none, and it was found that these last recovered more quickly than those who had the alcohol. Its deleterious effects on cases of Rheumatism, Gout, and Gonorrhœa, are also well known and yet, how many, apparently forgetful of these effects, order it very freely in this class of cases. *Perhaps* as a luxury in health it may be used extremely moderately without causing any very apparent derangement of the tissues of the body, but nevertheless it should be used very cautiously, and certainly forbidden to those who inherit any tendency to excess. It cannot be looked upon as useful for any other purpose. It is not a food in the true sense of the word, for a food should build up and replenish all the tissues of the body without being hurtful to any, this we have seen is not the case with Alcohol. Numerous statistics and observations have proved that Alcohol taken habitually is harmful in the tropics, nor is it less harmful in the cold of the Arctic regions. Experience coupled with experiments extending over lengthened periods, and carried out by able and careful observers, show that men can do more work and endure greater hardship without alcohol, than they can even with the so-called moderate doses of it, which many would have us believe are absolutely necessary in every condition of life.

There is another point which deserves our very careful attention in this age of hurry and rush, and that is, the very large numbers which are being admitted into our lunatic asylums and prisons, the victims of alcohol. A vast amount of insanity and crime are undoubtedly due to Alcohol, and though I regret I am unable to give you accurate figures to prove this fact, nevertheless I can affirm that it has been pretty conclusively proved that from $\frac{1}{4}$ to $\frac{1}{3}$ of the lunacy of the United Kingdom is due to drinking alcohol in excess. Dr. Walmesley of the Darenth Asylum says that "one-fourth of all cases of insanity are due to drink." M. Rochard speaking at

Nor must we forget how **greatly the prosperity of a nation depends upon the thrifty habits of its individuals**, if there is one thing more than another that appears to scatter thrift to the winds, it is Alcohol. The amount spent by moderate drinkers may be small comparatively speaking, nevertheless that sum might be far more advantageously laid out in food or other materials which instead of doing harm to the tissues of the body would help to protect and build them up. **Certainly the amount spent on alcohol by the poor, however small it may be, is undoubtedly a needless waste of money.**

I am quite aware of the fact that we shall never be able to stop the sale of alcohol entirely, nor break down the prejudice in favour of moderate quantities being taken habitually, but that is no reason why we should not do all we can to stay the tide which is sweeping so many to destruction. Are we persuaded, as

I hope I have said enough to show that there are very great disadvantages in the habitual use of Alcohol, if so my task will be lightened in showing you that there are very decided advantages in Total Abstinence. In the first place, the total abstainer avoids all the disadvantages resulting from the habitual use of alcohol. Other things being equal, he is a healthier man, and a richer man than the man that drinks, and therefore less likely to end his days in the lunatic asylum or the workhouse. He is less liable to suffer from accident, less likely to give way to his passions and he is a better law abiding subject. These facts are well brought out by the returns of our Army in India as furnished to the Secretary of the Army Temperance Association by the Adjutant-General in India. The figures are as follows:—

Taking the number of total abstainers as 20,675, and the number of non-abstainers as 49,758, the convictions per thousand are as follows:—

Abstainers	...	...	...	454
Non-abstainers	...	...	...	4282

2. Numbers summarily punished for insubordination. The statistics under this head are not so distinctly in favour of the members of the Association, though they show that the convictions

among non-abstainers per thousand are almost double those among abstainers.

Abstainers = 969 or 46.86 per thousand.

Non-Abstainers = 4,610 or 92.84 per thousand."

So much for crime. Now let us turn to the tables referring to the health of our Army as influenced by Total Abstinence. The table has been compiled from returns furnished by the courtesy of 26 Commanding Officers of batteries of Artillery, Cavalry and Infantry regiments for a period of six months ending 31st March 1895, and shows "That the admissions into Hospital per cent. among abstainers are 6.6, and among non-abstainers 12.0. The figures for last year were admissions among abstainers 5.5 and among non-abstainers 10.0." And there is also another point of vast importance to our Army in this country which I notice is most materially affected by this question. You are all aware that venereal diseases cause a very large number of admissions into our Station Hospitals. Last year there were altogether 24,184 admissions from amongst the British Troops, of these 5,514 were admissions amongst abstainers and 18,670 amongst non-abstainers, that is, admission amongst abstainers equalled 271.5 per thousand, whilst among non-abstainers they equalled to 375.4 per thousand. "These figures can leave no reasonable doubt in any mind that so far as health in India is concerned abstainers are much better off than non-abstainers." It is most satisfactory to note in passing that this Association is now firmly established in England, and was officially recognized by the late Secretary of State for War, through whom a grant of £500 was obtained for the one-year-old Army Temperance Association, "an unmistakeable proof of the belief at head quarters in the value of abstinence, as conducive to the health and good conduct of British Soldiers." But I am thankful to say it is not only in the Army that temperance and total abstinence are advancing with rapid strides; there are a large number of medical men, (more than 500,) in civil life who neither use alcohol themselves, nor prescribe it for their patients, (unless absolutely obliged to do so,) and even those who are not total abstainers themselves very strongly recommend total abstinence for the majority. Sir H. Thompson in "Food and Feeding" writes, "I am of opinion that the habitual use of wine, beer and spirits is a physiological error, say for nineteen persons out of

twenty, in other words, the great majority of the human race at any age or of either sex, will enjoy better health both of body and mind and will live longer without any alcoholic drinks whatever, than with the habitual indulgence in their use even although such use be what is popularly understood as moderate." Dr. A. Carpenter in the same letter to which I have previously referred writes, "Further enquiry has satisfied me that those who wish to enjoy perfect health had better avoid the daily use of alcohol, and that there are very few forms of disease in which its use is really beneficial. Now and then, no doubt, it is a powerful medicine but its very power makes it a fearfully dangerous weapon in the hands of people generally." After such authorities any opinion I could venture to give would be out of place. Let me rather suggest that a fuller study of this subject may well repay us. Through stress of work, and when hurried, some are at times apt to order popular remedies, such as alcohol more or less thoughtlessly, or perhaps because they think their sanction for alcohol in some form or other is desired by the patient, and if refused will be obtained elsewhere. That alcohol is really unnecessary in a very large proportion of cases is clearly shewn by the treatment of all sorts and conditions of men and women at the Temperance Hospital in London. That hospital has been in existence 21 years, and during that time 10,586 in-patients have been treated, of whom 5,006 are returned as total abstainers, and 5,580 as non-abstainers and unclassified. With the exception of infectious cases, all who apply for admission (provided there is room) however serious the case may be are admitted and treated in the wards, and if infectious disease should break out in the hospital the patients are isolated and treated exactly as they would be in any other hospital. No distinction is made between abstainers and non-abstainers. During the 21 years of the Hospital's existence, only 17 of the 10,586 in-patients have appeared, in the opinion of the Medical Staff, to require alcohol, and the Medical officers have always had a free hand to order it if they considered it necessary. The death-rate during that time has been 6.3 per cent. During the year 1894 there were 1,044 in-patients. Of these 701 were cured, 254 relieved and 59 died giving a mortality of 5.65 per cent.

I think it will be admitted these are very satisfactory figures: to my mind they show very conclusively that alcohol is not

required by patients in the liberal manner in which it is so often prescribed, and I am of opinion that it has often been poured down their throats quite unnecessarily, and, unfortunately, in very many cases it has been continued, long after it should have been discontinued, to the detriment not only of the patient's body, but also of his soul. If we realize as all true Christians must realize that no drunkard can inherit the Kingdom of GOD, surely we must see to it that we never start any of our patients or permit them to continue, if we can possibly help it, on the downward road which leads to the drunkard's grave; rather by our example, by our words of counsel, let us stand shoulder to shoulder with the clergy and fight against this evil. What is more we must not stop at moral persuasion only, there are many cases where moral persuasion is useless, they need compulsion. I look forward to the day when not only a local veto bill will be made law, and the sale of alcoholic liquors very much restricted, but I also look forward most eagerly to the day when the habitual drunkard will be confined, and prevented from being a curse to himself and his family, and a nuisance to his neighbours. We must look to prevention, coupled with high moral training if we would rid our land of the curse of Alcohol.

Here let me read you some extracts from two letters I have just received in answer to my queries.

Sir B. W. Richardson writes, on the 19th August. 1. "I have seen a good many persons from tropical climates who have been suffering from the effects of Alcohol, and I am certainly of opinion that the heat of tropical climates intensifies the bad effects of alcoholic indulgence. My impression has long been that the effect of alcohol specially intensifies the liver derangement and diseases of the tropics, and I am sure from abundant evidence that men live most easily and healthily in a tropical climate when they are not subjected to alcohol in any form. 2. I have for 24 years past entirely given up the use of alcohol for myself, and for nearly the same time have given up the use of it in practice. Certainly for 15 years I have given up the use altogether in practice. In the London Temperance Hospital to which I am physician and in which 25 beds are set aside for me, with further beds for any overflow of cases I have never once prescribed alcohol in any form, and have forbidden all substitutes. The results have been most satis-

factory amongst all classes of cases admitted, whether of abstainers or not, and whether severe or mild."

Dr. Norman Kerr, on the same date, writes, 1. "I have seen a number of cases of persons generally from 40 to 50 years of age who have suffered severely from alcoholism in tropical climates,—liver, kidneys, heart, stomach and brain lesions. In addition to such persons, (as with or without much alcoholic degradation of the structure or functions of vital organs,) many who become victims of Narcomania, (a mania for intoxication in any narcotic). The latter mental or nervine malady being infinitely more serious than what may be called the coarser lesions of cirrhotic liver or kidney. 2. In my opinion alcoholic intoxicants are much more deleterious in hot than in temperate climates. Alcohol is a paralyzant and a reducer, paralyzing in proportion to the quantity taken, modified to some extent by the capacity of the consumer to resist the poisonous action. In short, the symptoms of alcoholic slow poisoning are plainly those of progressive paralysis bodily and mental. Alcoholic reduction of the resisting powers is also gradual and often insensible. 3. I have entirely given up the personal use of alcoholic beverages for something like 40 years and not only am better than I was before. I gave it up, but have recovered from several acute illnesses, which (fact) my physicians as well as myself, attribute to having been so long an abstainer. In medical practice I very rarely prescribe an intoxicant. In emergencies I occasionally give a small quantity, if there is nothing else to be had at the moment, but practically I do not order intoxicants. I have never done so unless very guardedly and then for the occasion only."

It is with much gratification that I bring these letters to your notice, and my thanks are due to Sir B. W. Richardson and Dr. Norman Kerr for their trouble in answering my questions. The letters give the opinions of those who have seen the temperance movement almost from its earliest days, and they are now veterans who have stood in the forefront of the battle, and who have seen many that were opposed to them come over to their side, their opinions therefore are worthy of our serious consideration.

In conclusion, Mr. President and Gentlemen, I must thank you for the very patient hearing you have given me. I have received

most valuable assistance in preparing this paper from Dr. J. S. Ridge's small book on "Alcohol and Public Health," but nevertheless I cannot but feel I have done but scant justice to this very important subject. For this I must ask your pardon. Believe me I would far rather have sat as a listener, whilst some abler brain had expounded the great advantages to be derived, both by the individual and the nation at large, from total abstinence. I can only now hope that the discussion which will follow may fill up what has been wanting in my endeavours. "Truth," it has been said, "cannot exist without discussion, nor does she fear it."

Surgeon-Captain Elliot then read a note on the letter which the Honorary Secretary had received from the Honorary Secretary of the Victorian Branch of the Association, and said:—

MR. PRESIDENT AND GENTLEMEN,—You are aware that a very important letter has recently been received from the Victorian Branch of the British Medical Association. That letter was read at the last General Meeting of this Branch and it was decided to publish the valuable information it contained in the *Medical and Lay Papers*. When this letter was again brought up in the meeting of our Council, I was asked to bring the matter before you in the form of a short paper.

I need hardly remind you of the salient features of Dr. Mueller's campaign in favour of strychnine. In the course of two papers which I had the honour of reading before you, I believe that I was able to convince you all that Dr. Mueller's antidote is worse than useless. That gentleman replied to my papers in an article published in the *Indian Medical Record* of March 1895. His letter was of such a character that I did not deem it necessary or dignified to reply to it. A full answer was subsequently given by the Editor himself to all the leading points in Dr. Mueller's remarks. Though the mass of that article never could come into any scientific court as evidence, there were certain claims put forward that I felt demanded attention; the more so as Dr. Mueller has again addressed the Government of India on the subject, supporting his views by a repetition of these same claims, which are practically as follows:—

- (1) That the strychnine treatment has been fully introduced in Australia.

- (2) That the Medical profession there approve of its use and that they further approve of placing this dangerous remedy in the hands of the laity, in the form of strychnine syringes.
- (3) That owing to this treatment being so thoroughly introduced, deaths from snake bite have become a thing of the past in Australia.
- (4) That the bona fide character of Banerji's cases was attested by the recurrence of certain relapses which occurred on days subsequent to the patient's apparent recovery.

I was anxious to know whether these contentions would have the support of Australian Surgeons, and at the suggestion of Surgeon-Major Browning I drew out a list of questions bearing on these points, and submitted them to our President who very kindly forwarded them to our Honorary Secretary.

Surgeon-Major Smyth sent them on to the Honorary Secretary of the Victorian Branch, whose very courteous answer I will now read you. Before doing so I may be allowed to say that the symptoms of relapse which Dr. Mueller lays so much stress on, were quite unknown to me from my experience of snake-poisoned animals or from the writings of Indian Surgeons.

BRITISH MEDICAL ASSOCIATION,
(VICTORIAN BRANCH),
MELBOURNE, 1st August 1895.

JOHN SMYTH, Esq., M.D.,

Honorary Secretary,

South Indian Branch, British Medical Association.

DEAR SIR,

I duly laid your letter before the Council at its July meeting. The matters you allude to have been so often discussed—in several of our Societies, in our triennial congresses, in the public press and elsewhere that the Council thought it unnecessary to further discuss it, but merely to answer your questions.

1. The Strychnine treatment has been fully introduced in Australia in the sense of its having been well brought before the public and the profession and in having been amply tried.

2. The opinion of the profession as judged by the expressions of aggregate bodies is decidedly against the treatment.

3. The profession do not countenance its use by laymen. It has been used by laymen, and mainly through the advocacy of Dr. Mueller, hypodermic-syringe cases can be bought in some of the shops here. The police officials seem to be the laymen who almost invariably have used it in reported cases.

4. Deaths from snake bite are not a thing of the past. Cases of snake bite have been less frequent lately. This latter may be due to several causes, not now material.

As regards relapses Australian Surgeons have not noted these.

I may add that at the last Inter-Colonial Congress in Sydney, 1892, statistics were given of 57 cases treated and reported in the local journal after Dr. Mueller's treatment had been announced. Of 57 treated with Strychnine 10 died, of 10 treated otherwise one died. Of cases reported to the New South Wales Board of Health fifty-six were treated with Strychnine—five died; three hundred and three were treated otherwise, twelve died. Again Dr. McCrea then Government Medical Officer of Victoria, in the local journal of July, 1875, records one hundred and ninety cases treated by ordinary methods with eleven deaths.

In conclusion, I may state that it with pleasure that we are able to assist a sister Branch and that any further questions will be replied to by us if possible.

I am, dear Sir,

Yours sincerely,

W. L. MULLEN, M.D.,

Honorary Secretary.

GENTLEMEN,

You have heard the letter read. In the very home of this remedy opinions, facts and figures are crushingly against it and I feel that the present is one of those times when so far as convincing you is concerned, speech might be silver, but silence is certainly golden.

There is however one point more. We are to bring this letter before the profession and before the laity to whom Dr. Mueller has appealed. I would that it could be brought to the notice of our Government, with whose sanction the strychnine experiments on men are now being tried. No part of the evidence that this controversy has elicited is to my mind more pitiable than the straight forward answer of Dr. Nailor's Hospital Assistant. It is only necessary to read a very little way between the lines, before we see his tacit protest against the authority which led him on its assurance to hasten the death of his patient, if not to actually kill him. I will not weary you with details as this case together with another of the same kind was published by me in the *Indian Medical Gazette* of July, 1895. If any member cares for a copy of that paper he is welcome to one of the reprints on the table before you.

NOTICE

The attention of members is invited to the following by-law of the Branch.

BY-LAW XII.

Members absent from Madras are invited to send papers of professional interest to the Secretary, by whom they will be read at the Meetings of the Society, and all matters of general or special value will be printed and circulated.

5 2/3 2/3/18
Printed from the "Indian Medical Gazette," Vol., XXX, No. 12 (Dec. 1895.)

NOTES ON
THE TECHNIQUE OF SNAKE-POISON EXPERIMENTS.

BY
SURGEON-CAPTAIN R. H. ELLIOTT, M.B., F.R.C.S.

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Reprinted from the "Indian Medical Gazette," Vol. XXX No. 12 (Dec. 1895.)

NOTES ON THE TECHNIQUE OF SNAKE POISON EXPERIMENTS.

By SURGEON-CAPTAIN R. H. ELLIOTT, M.B., F.R.C.S.

THE following paper has been the outcome of my experience in work with snakes and snake poison.

I feel much diffidence in offering it for publication, but I am encouraged to do so by the reflection that small as my own experience has been, that of many others has been, if possible, smaller.

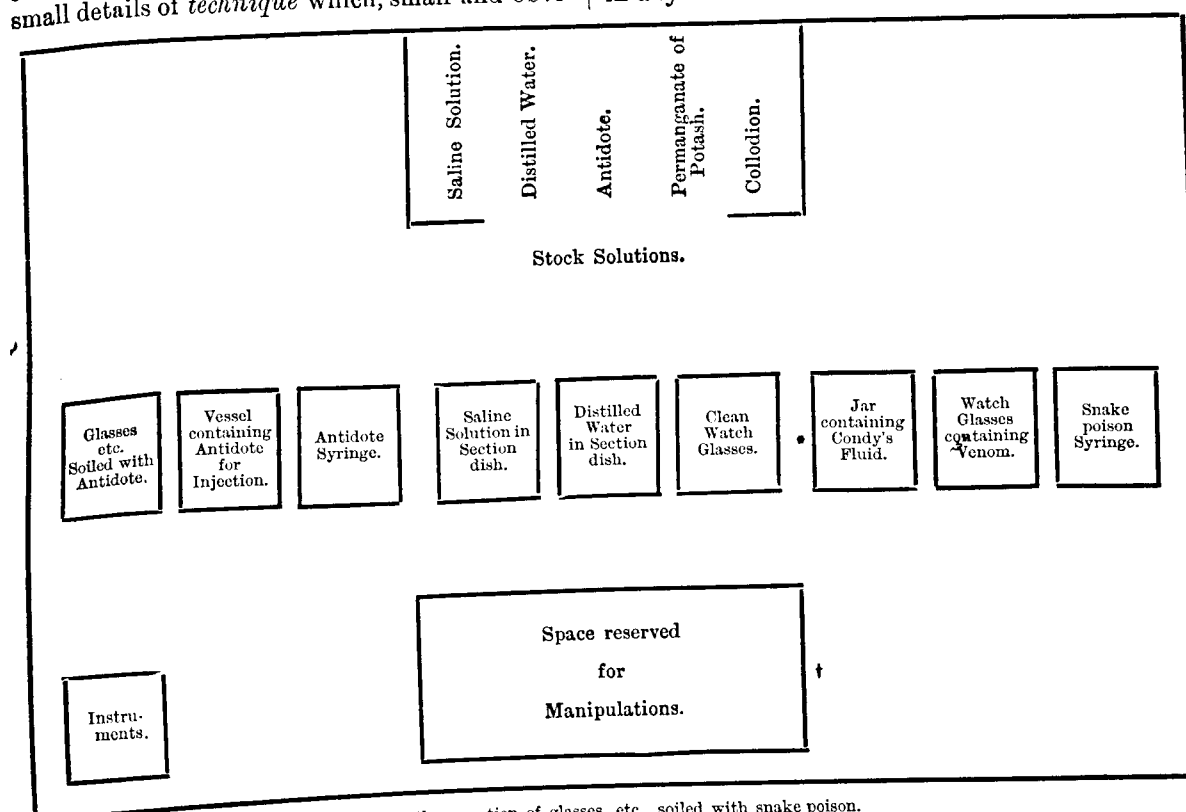
Work with a dangerous poison such as the thanatophidial venom must always be attended with risks, and these risks are very perceptibly heightened if the operator deals with living snakes.

When I started work a year ago, I did so in what ought to have been a state of bliss if the old adage is true. Little by little one learned small details of *technique* which, small and obvi-

ous as they may appear to be, are not always thought of at once.

In conducting syringe experiments, one point was from the first very clearly before my mind, and that was that if one wished to avoid mistakes and disaster, the manipulation employed must be conducted on most methodical principles.

A firm table should be selected about 6 feet long by 3 feet broad, this should be devoted to the manipulations connected with the poison and with the antidote under trial. Nobody should interfere with this table save the operator, and nothing but the instruments, etc., in actual use should be placed upon it. Bystanders or assistants should not talk to the operator, and the injecting syringes should never be allowed in any hands other than those of the principal.



The accompanying diagram will show in which way I arranged my table for my work on the pseudo antidote strychnine.

Each operator will, of course, modify this as best suits him. It is essential, however, that there should be some such arrangement, and that each article should be replaced in its proper place after use.

If the experimenter is using different kinds of snake poison, each should have its own syringe which should be clearly marked not only on the box, but also by cutting a distinctive mark on the syringe itself.

It is better not to bring more than one kind of snake poison with its accessories on the table at once.

In no case should the antidote and the virus be injected from the same syringe, and every antidote should, in my opinion, have its own special syringe.

The syringes should be in thorough working order, and the operator should never start work till he has satisfied himself that this is so. When dealing with snake poison, leaking syringes introduce two elements which we ought by all means to avoid, viz. :—

- (1) Danger to the operator.
- (2) Inaccuracy of result.

It is, of course, always advisable to exclude air from the syringe. This is done in the ordinary way by holding the needle upwards and gently pushing up the piston. In so doing, a certain amount of dissolved poison will flow down the side of the needle and reach the operator's fingers. This may be avoided by the simple device indicated in the accompanying diagram. The needle is passed through a small piece of blotting paper which effectually catches any overflowing drops. The soaked paper is then thrown into the permanganate solution jar when it is no longer a danger.

It is, of course, necessary that the amount of poison injected should be known as accurately as possible.

For rough comparative experiments, it is sufficient to drop the snake venom from the gland, drop by drop, into a number of watch glasses, putting one, two or three drops in each according to the amount to be used.

One drop of cobra poison weighs about $\frac{1}{10}$ of a grain when dried.

When a more accurate estimate is required the poison must be weighed in an accurate balance.

The watch glass containing it should be weighed when empty, and again with the poison

in it. The weight of the virus being thus known, a definite quantity of saline solution can be added, and the solution may be divided among several animals, thus supplying very accurate data for a comparative experiment.

I may here say that I have never experienced the least difficulty in getting any kind of snake virus dissolved in saline solution. All that is necessary is a glass stirring rod and a little patience.

Every glass should be labelled with—

- (a) the quantity of poison it contains ;
- (b) the nature of the poison ;
- (c) the date of its extraction ;
- (d) a note as to which gland it came from.

As to the method of removing the poison glands, these lie immediately behind the eye, and occupy nearly the whole of the side of the head in this region. Those of the cobra are met with at once on reflecting the skin in this region, while in the viperine snakes a thick dense fascia must be first divided. The glands are easily removed by cutting through the muscle fibres which overly them, and the strands of connective tissue which bind them and parts beneath. The poison duct must next be traced forwards and cut through last.

To express the poison from its gland, the latter may be held in a 4-folded piece of waste linen, with the duct end projecting; gentle pressure will force the poison out through the cut orifice. In dealing with the viscid poison of the colubrine snakes the above is a very simple procedure, as the venom flows slowly and in drops. When, however, one is working with the more liquid secretion of the vipers, it is necessary to direct the open end of the duct, towards the receiving watch glass with every care, as the poison is apt to squirt out, and should the duct be undirected, it will often turn on itself and scatter the dangerous fluid on the operator's hands or elsewhere. The first time that I extracted daboia poison, this accident happened to me, and it was some little time before I noticed two or three drops of the venom lying in the groove between my nail and my thumb. If I remember rightly my attention was drawn to the spot by a smarting sensation there. Now, a few words as to the method of managing the animals to be experimented on.

It is hardly necessary to state that the greatest care should be used in fixing the subject before one attempts to inject poison. A sudden violent movement of the animal may drive the needle, and with it the poison into the hand of the operator.

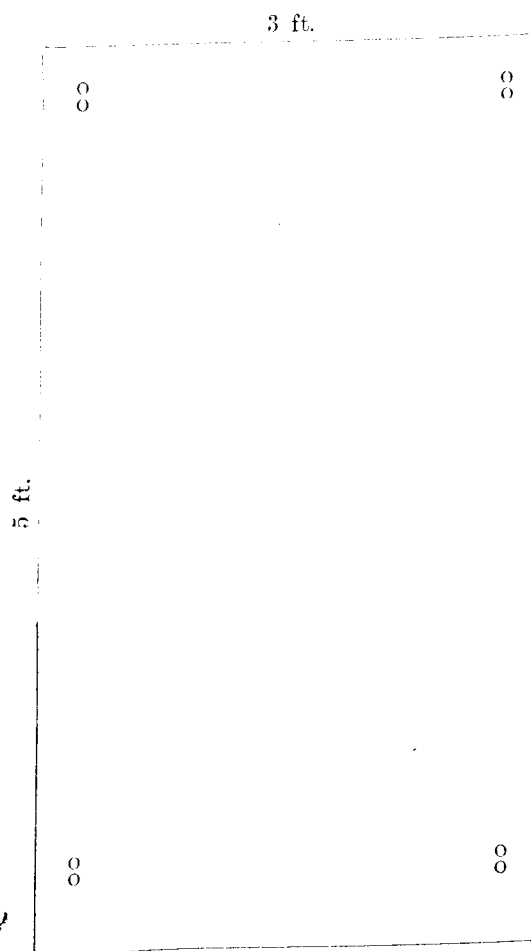
Small animals such as guinea-pigs, hares, ducks and fowls, can easily be held by an assistant, but in dealing with dogs, pigs, &c., more care must be exercised.

With regard to fowls, it is simpler to inject into their muscular tissue than to attempt a

subcutaneous injection, for the bazar fowl has but very little cellular tissue under the skin.

Monkeys are best managed by seizing the arms above the elbows and pinioning them back with one hand, while the other hand holds the animal's legs. In this attitude even a large monkey is quite helpless.

A little strategy will enable one to catch the elbows. If this fails, the animal must be covered with a rug and pressed down, while the two forearms are being secured.



For pigs, dogs, &c., I employ a special table of very simple make.

A flat board rests on two firm tressels. In this top are four sets of holes as shown in the figure.

The animal is allowed to stand on this table, while four ropes are attached by clove hitches to four legs.

As the animal stands on the table, the ropes attached to the off feet are passed over its body and through the near side holes, those attached to the near feet are passed along the table and the offside holes. The operator takes the pair of ropes on one side and his assistant takes those on the other. At a given signal both pull sharply together, and the animal, taken completely by surprise, is flung suddenly on its back.

By neglect of such a precaution I have seen what was nearly a very serious accident happen,

and I now never deal with large animals unless they are securely fixed.

If will be seen that I have dealt above with syringe experiments only.

I have done so because I have found the results of actual bites uncertain and variable, and therefore unreliable for comparative experiments.

When a snake bites an animal it is always difficult to be sure whether or not poison is injected, while the quantity of the venom is still more uncertain.

I once saw a dog fairly bitten by a large daboia, which had poison in its glands, and yet that dog not only did not die, but was very little the worse for the bite.

It is, moreover, very difficult to make a snake bite just when it is wanted to. To this rule the vicious little Echis is the only exception I know.

If, however, a bite is desired, it is, I believe, a mistake to allow the snake to be handled. A handled snake quickly becomes frightened, and then endeavours to escape at all costs. Leave the reptile alone and endeavour to make the subject walk over it in search of food. This is far the readiest method of attaining the desired end. Dogs at least show no fear whatever of so dangerous an enemy as the daboia, and even after they have been threatened with a strike, they will again venture into danger after a tempting morsel.

If the subject is unwilling, it can be made to tread on the snake by tying it to a long stick and dragging it over the fatal spot.

On no account should the operator come within reach of the snake in endeavouring to make it bite a victim. I have more than once seen a snake strike round the object offered to it, at my own person, and on one occasion I was all but caught by a daboia in this way. Dr. Henderson tells me he has noticed the same thing.

Personally, I am not in favour with experiments in which the snake's jaws are artificially opened and closed on the part to be bitten. The proper co-ordination of the act is then interfered with, and the result must be correspondingly unsatisfactory. It is hardly safe to assume that in such a bite the erection of the fangs can be relied upon.

With regard to the question as to whether the cobra does erect its fangs, in delivering a bite, I am wholly with Nicholson in believing that it does, nor can I understand how anyone can examine the mobility of the parts in question and remain in doubt on this point.

I almost hesitate to offer these few notes for publication, but the knowledge that the harvest is great, and the labourers few, leads me to do it.

I offer them in the hopes that the very simplicity of the technique they discuss may lead other men to spend some part of the long long Indian days in this most fascinating work, and then to help forward the day when we shall have a snake-bite cure which shall be not only efficient, but also within the reach of the million.

No. 273

58
OFFICE OF SURGEON-GENERAL

WITH THE GOVERNMENT OF MADRAS,

Memorandum 282
Madras, 28th March 189

From

SURGEON-MAJOR-GENERAL C. SIBTHORPE, C.B., F.R.C.P.I.,

SURGEON-GENERAL WITH THE

GOVERNMENT OF MADRAS,

To

THE HON'BLE THE CHIEF SECRETARY TO GOVERNMENT,

Public DEPARTMENT.

SIR,

With reference to your Memorandum No. 743, Public, dated the 19th March 1898, I have the honour to forward a copy of the report by Surgeon-Captain Elliot on the sample of wet antivenene sent out by Professor Fraser of Edinburgh.

2. I also enclose four notes by him on strychnine as an antidote to snake poison.

3. Surgeon-Captain Elliot reports that he regrets he is unable for various reasons to forward copies of his other papers.

I have the honour to be,

C. Sibthorpe

Surgeon-General

with the Govt. of Madras

14

C. No. 10. & 1255

SUBJECT.

Grant of Rs. 600 for experimenting

in snake-bite cures.

~~HIS EXCELLENCY THE GOVERNOR.~~

THE HON'BLE SIR HENRY BLISS, K.C.I.E.

~~THE HON'BLE MR. GROSE, C.I.E.~~

FOR ORDERS.

A

A grant of Rs. 600 is applied for by Surgeon-Captain Elliott through the Surgeon-General to cover cost of a fresh series of experiments with snake-bite cures. This amount is intended to cover a year's experiments, and will include cost of purchase and feeding of animals, erection of inoculation shed, purchase of instruments, and pay of assistants.

B

2. No precedent for a grant of this kind can be traced, but in G.O. No. 266 Public dated 26th July 1927 India's directions regarding collection and despatch of venoms to Dr. Calmette were communicated. There are no papers also India helping Fraser to obtain supply of venoms, as stated by Surgeon-Captain Elliott.

15

3. The enclosures to the latest current show that Surgeon-Captain Elliott has found that the antivenene sent by Prof. Fraser saved two monkeys from death with cobra-poison, and that he de

no

Papers to be read in Proceedings:—

Again GO., No.

, dated

189 .

Again G.O., No.

, dated

189 .

Current No.

910 of 1898, dated

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his.

A grant of Rs 600. is
*sanctioned to enable
Surf. Cept. Elliot to
continue his experiments
for the discovery of a
remedy against ^{venom.} snake-bite.
~~poisonous~~ snake-bite.

2. A detailed statement of expenditure should be submitted to Govt. through the S. G. at the end of the current official year, together with a full report on the experiments made.

For orders

16

MA 8.4.98

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not believe in the doctrine of the
 "right to life" of the embryo.
 General considerations that I would like to
 illustrate, are the following:
 First, the embryo is not a person.
 Second, the embryo is not a human being.
 Third, the embryo is not a child.

here
5 to 10 $\frac{M}{5/4/10}$

Surg. Capt. Elliot is one of
the best Medical Officers who
has shown any gift for
original research. His
experiments ^{with snake poison} have attracted
considerable attention though
at present only negative results have been obtained and
it will I think be well to
comply with his request
supported by the S. G. &
give him a grant of
£100 to continue
his experiments for the
recovery of a remedy against snake bite.
Sept. 12 1896

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G.O. No.
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QUEST N.

To C. No.

OF GOVERNMENT

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WITH DITTO

FILED UP, BEING MEANT FOR DESPATCH
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 B = Not to be copied.
 F = Copy abstract only.
 Q = Copy heading only.

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