

Fig 1.



Under influence of genuine Battley's Solution of Opium

Fig 2.



Under influence of "Pritchard's Battley."

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ORIGINAL COMMUNICATIONS.

I.—*On the Detection of Aconite by its Physiological Action; being notes of Experiments made in connection with the trial of Dr. E. W. Pritchard.* By FREDERICK PENNY, F.R.S.E., Professor of Chemistry, Andersonian University, Glasgow, and JAMES ADAMS, M.D., F.F.P.S. Glasgow. ✓

THE recent trial of Dr. Pritchard for the murder by poison of his wife and mother-in-law, is likely to take a high place in the *causes célèbres* of this country. Irrespective of those circumstances which distinguished the crime as peculiarly cruel and revolting, there existed in the singular combination of poisonous agents employed, and in the means used for their detection, considerations of special interest to the medical profession; and it is with the view of satisfying the numerous inquiries which have been addressed to us that we have prepared the present communication.

Besides conducting an independent examination of the organs of both ladies, similar to that committed to Dr. Douglas Maclagan of Edinburgh, and the results of which are fully described in Dr. Penny's reports to the Crown, and read by him in giving evidence at the trial, there was entrusted to Dr. Penny another, and a very extensive and difficult, investigation. He was required to report upon the nature and properties of a large number of articles of food—of various substances, labelled to indicate that they were officinal preparations of well-known drugs—and of various other articles, regarding the nature of which there was no clue. These were not delivered at one time, but were brought at irregular intervals up to a date very shortly preceding the criminal trial.

Among other articles undergoing examination, there were several phials, some of which were labelled and some not, containing

"Tinct. Conii," "Tinct. Digital," "Tinct. Hyoscy.," "Tinct. Aconit.," "Battley's Sedative Solution," &c., &c., all of which were clearly and satisfactorily identified. The contents of the phial labelled "Battley's Solution," which, as shown at the trial, had been found in Mrs. Taylor's pocket, was tested for mercury, antimony, and various other metallic poisons, and the results showed the presence of antimony in a soluble form, in the proportion of one grain and a half of tartarized antimony to the fluid ounce. The discovery of an extraneous admixture directed special attention to this Battley's solution, which we shall hereafter call "Pritchard's Battley," and led to its chemical examination for the leading organic alkaloids, other than those existing in genuine Battley. After a fruitless search for the presence of strychnia, veratria, conia, and hyoscyamia, a small quantity of the liquid was evaporated in a watch glass, and the soft extract applied to the tip of the tongue, when there was felt quickly supervening upon the taste of *genuine* Battley's solution a peculiar benumbing and tingling sensation, increasing in intensity for a short time, and persisting for some hours. In numerous comparative trials with genuine Battley's solution, obtained from various sources, it became very clearly evident that there was a something characteristic in the taste of the Pritchard Battley, and suspicion turned to the probability of an admixture of aconite. Observations made with an evaporated soft extract of Fleming's tincture of aconite, with and without a mixture of genuine Battley, gave sensations so perfectly corresponding, that strong presumptive evidence was now obtained of the presence of aconite in the suspected fluid.

By Stas's well-known process, and by other chemical means, more distinct indications of aconite were obtained; but the unreliable and altogether inconclusive character of all known processes in chemistry for the detection and unequivocal identification of certain vegetable poisons, especially when contained in organic mixtures, and also the necessity of husbanding what remained of the suspected liquid, were sufficient reasons for determining that no time or material should be wasted in further chemical analyses, and a series of experiments upon animals was therefore determined on and planned.

It was at this stage of the investigation that Dr. Penny, finding that he would not be able, unaided, to overtake so extensive an inquiry, owing to the limited time at his disposal, and having a part of the analysis still on hand, solicited the assistance of Dr. Adams. Ere this date, however, the list of witnesses against the prisoner had been closed and served, and hence Dr. Adams was precluded by the statutory limitations from appearing in evidence at the trial.

In publishing the notes and results of our observations and experiments, we wish it understood that we do not claim for them the character of a scientific or complete physiological investigation. They are intended simply to convey to the medical profession such details as may show the practical nature of the inquiry which we conducted, and at the same time enable a judgment to be formed by others as to the value of those conclusions at which we arrived as a result of that inquiry.

We have also to add, that the very limited time at our command before the trial, debarred us from attempting an exhaustive physiological course of experiments, and at the same time prevented us from making microscopic examinations, analyzing the blood, &c., &c.

In view of the fact that different kinds of animals are differently affected by the same agent, we resolved to restrict our observations to one class, and several satisfactory considerations led us to select the rabbit. It appeared to us of little moment, that the phenomena manifested in our trials with the rabbit should differ from those exhibited by the human subject when under the influence of the same agent. For our purpose it was sufficient if the action of the toxic agent was uniform and characteristic, when employed on the same animal.

Our object in these altogether practical experiments was twofold—first, to determine if the suspected liquid contained anything destructive to life, when employed in a dose which would have been safe, assuming it to contain no foreign substance; and second, to determine what that foreign substance was, of the presence of which we were already clearly satisfied.

The details of these experiments, although somewhat tedious, can scarcely be omitted without a corresponding loss of practical usefulness. For that which may seem unimportant to one observer, and perhaps only casually introduced in the record, becomes often to another the single or strongest point of interest, and the clue which may lead either to separate investigation or to another conclusion. It is not sufficient, unless for popular comprehension, to state that certain agents are destructive to life in certain doses, and that paralysis or convulsions is a common effect; but for satisfactory reference and comparison it is necessary to describe the exact form in which the agent has been employed, and the order and precise nature of the phenomena observed.

For several sufficient reasons we thought it advisable to make a number of concurrent experiments with atropia, veratria, conia, hyoscyamia, strychnia, digitalis, &c.; but as these do not properly come within the scope of our present communication, we shall not allude to them further than to say that some of them

proved extremely interesting; and as our inquiry widened, there grew in our minds a conviction that the physiological test in its application to the detection of vegetable poisons presented a more inviting field for toxicologists than had hitherto been admitted, and we hope at another date to present some of the conclusions we have reached regarding certain of the alkaloidal poisons. Meanwhile we restrict ourselves to the special investigation of Pritchard's Battley. The agents we employed were—

1. Genuine Battley's solution of opium procured from Murdoch Brothers, and taken from the same stock bottle out of which the phial containing Pritchard's Battley was filled.

2. Tincture of aconite (Fleming's).

3. Mixtures of tincture of aconite with genuine Battley in various proportions.

4. Pritchard's Battley.

These agents were prepared for the purposes of experiment, by being evaporated, either at a gentle heat, or by evaporation *in vacuo* over sulphuric acid, to a soft extract, which was then dissolved or suspended in a measured quantity of pure water.

In a number of experiments, the extract prepared from genuine Battley, and that from tincture of aconite, was either introduced into the stomach or dropped upon the eye; but while the characteristic effects were unequivocal, we were satisfied that so much more agitation and alarm were produced by the greater and more prolonged handling of the animal, that we soon abandoned this mode of operating. Moreover, we found that the quantity of the agent required to produce the same effects was more variable—the interval occurring before the symptoms became manifest more uncertain, and the duration of the experiment prolonged to so tedious a degree, that observation became difficult and less reliable. To these experiments we therefore only refer as corroborative of the phenomena otherwise generally observed.

In the very large proportion of instances we injected the agents beneath the skin, selecting the fold of integument at the flank or between the skin and muscles of the back. In this operation we employed a small graduated glass syringe, armed with a needle, perforated through its entire length; taking care in every instance to avoid injury of the large vessels and nerves, or penetration of any of the cavities.

This method of hypodermic injection is almost literally painless, and in execution is easy, rapid, and complete, while the action of like quantities of the same agent is better contrasted as regards the time within which the characteristic effects begin to be noticeable. These variations were generally within small limits, and seemed to bear a close relation to the age and strength of the animal.

The following table shows the number of experiments of which the results were systematically observed:—

1. GENUINE BATTLETT'S SOLUTION.			
Introduced into stomach,.....	2	}	
" " eye,.....	2	}	
" " under skin,.....	5	}	9
2. TINCTURE OF ACONITE (FLEMING'S).			
Introduced into stomach,.....	3	}	
" " eye,	3	}	
" " under skin,.....	2	}	8
3. GENUINE BATTLETT'S SOLUTION AND TINCTURE OF ACONITE (FLEMING'S), MIXED IN VARIOUS PROPORTIONS.			
Introduced into stomach,.....	2	}	
" " eye,.....	1	}	
" " under skin,.....	10	}	13
4. PRITCHARD'S BATTLETT.			
Introduced under skin,.....			5

Of the facts observed in these experiments we shall now give a summary, referring for more precise details to the Appendix, where we record such a selection of experiments as will indicate the general character of the whole.

GENUINE BATTLETT'S SEDATIVE SOLUTION.

In one instance ten grains were introduced into the stomach. In another, 100 grains were employed. The quantities injected under the skin varied from ten to fifty grains. In no instance did death occur.

Within 10 minutes of the introduction of the poison by injection under the skin the animal seeks a prone position, lying fully extended on belly and chest—the head resting on the ground—the legs sprawling—the claws concealed (Fig. 1). If undisturbed, it inclines to retain this position, rarely shifting its place or attitude. When urged to motion, it crawls a few paces in a tortoise-like manner, but speedily subsides into its former passive, motionless condition. When lifted by the ears it struggles, and when laid on side it recovers its legs. A sharp noise or heavy footfall attracts its notice. The eyes remain open, and only tend to close at occasional long intervals. The pupils are dilated. The respiration is slow and gentle. In from 5 to 8 hours the effects begin to pass away, and in about 14 hours the animal eats freely, and exhibits vivacity in its movements.

In carrying out these trials with Battley's solution, an impression gained force in our minds that there is still much knowledge to be acquired, and much of error to be removed, regarding the action of the nervine poisons generally. We are led, therefore, to request particular attention to the fact that no convulsions,

or tendency to such, was exhibited in any of the animals experimented upon with Battley's solution. This is opposed to common belief, for, without specifying names, we may simply observe that every authority we have consulted mentions, in express terms, the occurrence of convulsions as a usual and characteristic action of opium in mammiferous animals, and in many instances rabbits are referred to as among the animals subjected to experiment. Such a mistake, as we hold it to be, may be accounted for in part by the circumstance that authors of systematic treatises cannot reasonably be expected to verify, by personal experience, the statements of observers of good repute, from whose writings quotations are usually made. Re-copied and re-transferred these statements are at last, in many instances, accepted as beyond cavil. In the case of opium, familiarity with the drug and the usual faithful description of its ordinary effects on man, have probably assisted in securing a too hasty acquiescence in the common statement of its effects on animals. Be this as it may, we have satisfied ourselves that, as regards rabbits, no convulsive seizures attend the action of opium. As Battley's liquor is a watery solution from which a certain portion of the drug is excluded, we made three experiments with laudanum, a soft extract of which, prepared by evaporation, as in the other instances, was employed. In one case we injected the extract of twenty grains by weight beneath the skin of the back of a six weeks' rabbit; in the second fifty grains, and in the third one hundred grains, in both cases on full-grown rabbits. The effects produced were identical with those caused by Battley's solution, with this exception, that while there was an equal indisposition on the part of the animal to move its position until stimulated and urged, there was a difference in the character of the progression of the animal along the floor. Under laudanum the animal moved with its customary leaping action, and seemed to have entire power of its limbs, while Battley's solution induced a condition in which the movements were of a crawling nature. But in no other respect was there any contrast.

TINCTURE OF ACONITE (FLEMING'S).

In one instance five grains, and in a second seven and a half grains, were introduced into the stomach; the animals recovered. Fifty grains introduced into the stomach caused death in 15 minutes. Half a grain dropped into the eye produced all the characteristic effects. Two grains injected under the skin resulted in recovery in 1 hour 15 minutes, and four grains applied in the same way caused death in 3 hours 15 minutes.

The symptoms vary in the order and in the rapidity of their production according to the strength of the dose. In a case

proving fatal, and where there has been time for the development of the effects, there is first an interval of restless uneasiness, during which the animal shifts its position, and occasionally couches, with one or both hind legs extended laterally. It remains for a short interval in an attitude of expectancy or watchfulness, during which a twitching of the lips and a chewing action of the jaws is observed. Gradually the limbs become awkwardly stiff—the claws protruded, and the feet sprawling, as if grasping the floor—the animal seemingly steadying itself. The head is carried erect and somewhat retracted—the nostrils expanded. Occasional spasmodic movements of the ribs and belly occur as if retching.* Suddenly the animal staggers and rolls over, quickly regaining its feet. Saliva begins to flow from the mouth, and soon after peculiar chirping or stridulous cries are emitted (Fig. 2). The severe convulsions which quickly and invariably follow, are of an opisthotonic character, the limbs being extended in a straight line with the body—the back arched, and the head excessively drawn back. In a few seconds the convulsions subside, and the limbs become relaxed, the animal lying helplessly on its side. After a longer or shorter interval, it is then occasionally affected with an impulse to rush madly forward or make violent leaps, without regard to obstacles; but the motions are of an abortive paralytic character—the legs sprawling about in a floundering, jerking sort of action, altogether different from the usual leaping motion of the animal. After one or more convulsive seizures, it lies on its side with head retracted—nostrils distended—flanks heaving—the forepaws spread apart and held in the air. The respiration becomes very evidently laborious, is quite audible, and seems altogether diaphragmatic or abdominal. In this utterly helpless condition it is still sensible to stimuli; it winces when the cornea is touched, and is roused to momentary effort on pulling or squeezing the ears, legs, or tail. Salivation continues, but no longer accompanied by the twitching, chewing movements; the eyelids are half-closed or drooping; the pupil usually contracted. In this prostrate state, an interval of many minutes, or even of some hours, may elapse, during which occasional convulsive seizures may occur. Frequently, at the termination of such seizure, the urine is forcibly discharged. At length a strong convulsion takes place, and the animal dies. The limbs immediately relax, and the pupil begins to dilate. *Rigor mortis* is nearly complete in from 40 to 60 minutes.

GENUINE BATTLE'S SOLUTION AND TINCTURE OF ACONITE.

Fleming's tincture of aconite was mixed with genuine Battle's solution in proportions varying from one of the former to from

* A rabbit does not vomit.

four to eighteen of the latter. In one instance death was caused by one grain mixed with nine; in another, two grains mixed with ten. In both instances the poison was injected beneath the skin.

There was caused by a mixture of these agents an evident blending of the symptoms produced by both, but the action of the aconite predominated. When, however, the Battley was employed in the large proportion of eighteen to one of the aconite, the conditions were reversed. When a full dose of both in a state of mixture was used, there was at first less of the active uneasiness than was noticed with the aconite alone, on the contrary, a stronger disposition to couch or rest was manifested; but when doing so, the head was invariably carried erect. On being urged to motion, the hobbling or crawling progression, as opposed to the spasmodic jerking action observed with aconite, was more strongly marked. The convulsive seizures did not, however, seem to be lessened in severity, but the intervals of relaxation were longer, and during these intervals the action of the Battley became evident.

PRITCHARD'S BATTLEY.

The symptoms are so closely similar to those of Battley's solution mixed with aconite, that, *nomine mutando*, the one will pass for the other. No possible distinction could be drawn from the appearances presented by an animal suffering from the effects of a dose of Pritchard's Battley and of another undergoing, at same time, the effects of a mixture of Battley and aconite.

We think it preferable to indicate thus shortly the action of Pritchard's Battley, instead of summarizing its effects, as we have done with aconite and Battley's solution respectively, because, in all experiments wherein vital action is exhibited, there will invariably be found some points of difference in the occurrence, order, or character of individual phenomena. We trust that the description we have given of the effects of aconite and of Battley's solution, when used alone, is sufficiently clear for the purpose of comparison and reference; and with that circumstance kept in view, we believe that the larger number and fuller details we have given, in the Appendix, of experiments with Pritchard's Battley, will enable our readers better to appreciate the nature of those points of similarity by which we ourselves were satisfied regarding the composition of Pritchard's Battley.

Referring, for example, to experiments No. 27 and No. 34, it will be seen that, although there was a difference in the strength of the animals operated on, probably also in the dose of the agent employed, these influencing, no doubt, the duration of the experiments, there was yet such a close correspondence in the general

effects that no essential difference in the character of the phenomena can be detected.

Having thus by clear and satisfactory evidence established the characteristic and essential differences in the effects produced on the rabbit by genuine Battley and Pritchard's Battley respectively; and having found that the action of Pritchard's Battley in a fatal dose corresponded in every respect with that of aconite, either alone or when mixed with genuine Battley; and bearing in mind the peculiar and distinctive sensation communicated to the organ of taste by the above liquids—we had no hesitation in arriving at the following conclusions:—

1st. That Pritchard's Battley contained a poisonous substance.

2nd. That that poisonous substance was aconite.

We may also state, that from a careful consideration and comparison of the intensity, the period of access, and the duration of the symptoms exhibited in our trials with the mixtures of tincture of aconite and of Battley's solution in known quantities, we were led to infer that the proportion of the former in Pritchard's Battley was from five to ten per cent. We disregarded the infinitesimal proportion of antimony discovered in Pritchard's Battley, being satisfied that it could not in any way influence the symptoms we witnessed.

Our conclusions were confirmed by the fact of our finding no effects analogous to those of aconite produced by any of the other agents (veratrina, strychnia, &c., &c.) employed by us in the concurrent experiments already referred to, or by any other poisonous agent with the action of which we were familiar.

With the medical aspects of the criminal trial our inquiry had no necessary connection, and we, therefore, purposely avoid any commentary on the peculiar symptoms manifested by Mrs. Taylor and Mrs. Pritchard. Neither have we attempted to draw any analogy between the action of the poisonous agents as displayed upon animals and those produced on the human subject. These considerations form sides of the case altogether apart from those which we attempted to uncover, and were otherwise dealt with by the special medical and general evidence. That the unfortunate ladies were poisoned was clearly proved, and the prisoner ultimately admitted that he did put aconite into the Battley's solution. The detection of that aconite was the problem that our experiments were intended to solve; and although the confession of the criminal has no doubt aided the complete acquiescence of the public in the justice of the verdict, yet his admission or denial could not in any way influence our convictions, nor the conclusions to which we had already committed ourselves.

A.

TABLE OF EXPERIMENTS,

SHOWING PROPORTION OF AGENTS EMPLOYED, HOW INTRODUCED, AND RESULTS.

No.	Agent.	Introduced.	Results, &c.
BATTLETT'S SOLUTION.			
1	10 grains,.....	Into stomach.	Recovered. Large rabbit.
2	100 ".....	"	" " "
3	2 ".....	Into eye.	" " "
4	10 ".....	"	" " "
5	10 ".....	Under skin.	" Young rabbit.
6	10 ".....	"	" Large rabbit.
7	20 ".....	"	" " "
8	40 ".....	"	" " "
9	50 ".....	"	" " "
TINCTURE ACONITE.			
10	5 grains,.....	Into stomach.	Recovered. Large rabbit.
11	7½ ".....	"	" " "
12	50 ".....	"	Death in 15 } " "
13	1 ".....	Into eye.	Recovered. " "
14	½ ".....	"	" " "
15	2 ".....	"	" " "
16	2 ".....	Under skin.	" " "
17	4 ".....	"	Death in 3 } " "
MIXTURE OF BATTLETT & ACONITE.			
18	Battlett, 8 grains; Aconite, 2 grains.	Into stomach.	Recovered. Large rabbit.
19	" 10 " " 2 "	"	" " "
20	" 4 " " 1 "	Into eye.	" Young rabbit.
21	" 2½ " " ½ "	Under skin.	" Large rabbit.
22	" 9 " " 1 "	"	" " "
23	" 9 " " 1 "	"	Death in 44 } Young rabbit
24	" 18 " " 1½ "	"	minutes. } " "
25	" 18 " " 1 "	"	Recovered. Large rabbit.
26	" 8 " " 2 "	"	" " "
27	" 36 " " 4 "	"	Death in } Full grown buck
28	" 5 " " 5 "	"	49 minutes } rabbit in strong
29	" 45 " " 5 "	"	minutes. } condition.
30	" 50 " " 10 "	"	Death in 15 } Large rabbit.
31	" 5 " " 5 "	"	minutes. } " "
32	" 45 " " 5 "	"	Death in 6½ } " "
33	" 50 " " 10 "	"	minutes. } " "
34	" 50 " " 10 "	"	Death in 2 } Young rabbit
35	" 50 " " 10 "	"	minutes. } " "
PRITCHARD'S BATTLETT.			
31	10 grains,.....	Under skin.	Recovered. Young rabbit.
32	10 ".....	"	" Large rabbit.
33	20 ".....	"	" " "
34	40 ".....	"	Death in 53 } " "
35	50 ".....	"	minutes. } " "
			Death in 29 } " "
			minutes. } " "

B.

SELECTED EXPERIMENTS.

BATTLETT'S SOLUTION OF OPIUM.

Expt. No. 6.—Ten grains Battley's solution was injected in the fold of integument of right flank of a full-grown buck rabbit. Within 10 minutes the animal lay down prone and fully extended on its belly and chest, the head resting on the ground, the hind legs apart and sprawling. At the end of 45 minutes it continued in the same position, capable of being roused, but evidently indisposed to exertion. When urged to motion it would crawl a few paces in a tortoise-like manner, never attempting the leaping motion characteristic of the animal's ordinary movements, and quickly subsiding into a torpid or lethargic condition. When lifted by the ears it struggled actively, and it resisted being laid on its side. The eyes remained widely open, the pupils dilated. The respiration very gentle. Watched closely for three hours, no change in condition was observed. At the end of 6 hours it was recovering its natural manner, and moved with a leaping action, but was still somewhat lethargic.

Expt. No. 8.—Forty grains Battley's solution was injected in the fold of integument of the left flank of a full-grown buck rabbit. It moved about with ordinary activity for about 5 minutes, but within 7 minutes lay down, with the head resting on the ground, quite torpid and helpless; the whole body subsided, flattened out and extended at full length; the tail flaccid and drooping, but the ears erect, the claws retracted. (Fig. 1.) The entire frame seemed thoroughly relaxed and prostrate, and seeking the support of the floor—a condition, in short, of perfect inanity. At the end of 22 minutes, as it showed no disposition to move, although evidently wide awake, as its eyes were fully expanded and it noticed and watched any threatening gesture applied to it, it was urged to motion and it then *crawled* a few paces like a tortoise. It permitted itself to be shoved along the floor readily enough, but would not lie on its side when so placed, invariably recovering its feet when the attempt was made. The pupils seemed rather dilated; the respiration was slow and gentle. Watched closely for 2 hours, no change was observed. Next day it had quite recovered.

TINCTURE OF ACONITE (FLEMING'S).

Expt. No. 16.—Two grains by weight of Fleming's tincture of aconite, was injected under the skin in the left flank of a full-grown doe rabbit. A small quantity was spilled in the operation. The animal moved actively and in its usual manner for 3

minutes, when it couched, but almost instantly got up again, showing signs of uneasiness. During the next 5 minutes it was very restless, shifting its position as if under sudden impulses. At the end of 10 minutes it placed itself in a position half couching, but the body not resting on the ground; the head was retracted, the paws spread as if grasping the floor; the tail incurved, and the whole attitude expressive of alarm. (Fig. 2.) An active twitching of the lips and chewing motion of the jaws began. After 13 minutes, faint gasping cries were uttered, the breathing became laborious and performed with deep fetches, and distinctly audible. After 38 minutes, copious salivation began. The animal frequently shifted its position, generally with one movement, and only a few inches at a time. The head was kept continually upright, and somewhat retracted. After 48 minutes, the twitching and chewing motion of the jaws and lips, the salivation, the occasional utterance of faint cries, and the retracted position of the head, continued prominent symptoms. But the animal's condition was otherwise improving—the breathing was less laboured, and at intervals it ran about actively, coming occasionally to an abrupt stop, sitting up on its haunches, and carrying on actively the chewing motions for a few seconds. After one hour and a quarter it had nearly recovered its ordinary condition.

Expt. No. 17.—Four grains Fleming's tincture of aconite, was injected between the skin and muscles of the back of a large brown buck rabbit. It immediately displayed lively agitation, shifting its position incessantly, and frequently licking the wound made in its back by the injecting needle, which this time seemed to have found an extra-sensitive spot. At the end of 8 minutes, it fell or threw itself prostrate on its flank, with hind legs extended far from body, but speedily got up again and continued its active uneasy movements. After 13 minutes, it placed itself in the peculiar position described in preceding experiment; the twitching of jaws commenced and the head was retracted, with at same time a marked aspect of alarm. After 17 minutes, it uttered choking cries—the nostrils expanded, and the respiration was performed with laborious catches. The motions of the animal continued untiringly active. After 22 minutes, active salivation was manifest. After 35 minutes, there was extreme retraction of head. The animal continued still actively moving about, but in a paralyzed manner, occasionally staggering and falling on its flank. At intervals it seemed to be delirious, and made violent struggling efforts to force itself through openings in the basket cage in which it was confined. These efforts were made in spasmodic rushes, sometimes a spring being made from the prone posture. When successful in forcing itself through an opening the animal darted wildly forward with a floundering staggering movement for

several yards, occasionally striking in a regardless manner against obstacles. The head continued violently retracted, the nostrils expanded, but the breathing was becoming gradually slower and feebler, and still performed in a laborious manner. At intervals it lay on its side in a very prostrate condition. After 57 minutes, there occurred marked opisthotonic convulsions, followed by extreme prostration, the animal lying on its side—the limbs and muscles of chest relaxed, but the head always stiffly retracted. After 60 minutes, while lying exhausted it was quite sensitive to the ears and legs being pulled or squeezed hard, and under continued and active rousing it was capable of making efforts to get away, but quite incapable of regaining the upright posture. After 1 hour 35 minutes, it continued lying on its side in the same helpless condition—the breathing slow, distressed, and quite audible. After 2 hours 30 minutes, it discharged urine with force. After 2 hours 35 minutes, sharp convulsions occurred, at termination of which the animal rolled over on its back—the fore paws extended in air, the head stiffly retracted, the nostrils expanded, the breathing laborious. After 3 hours 25 minutes, no change in condition, excepting that the respiration became gradually feebler and slower, being 10 per minute. After 3 hours 30 minutes, violent opisthotonic convulsions occurred, accompanied with choking cries, and followed by death. The limbs immediately became flaccid, and the pupil, which was contracted, began to dilate. *Rigor mortis* was complete, 40 minutes after death.

BATTLETT'S SOLUTION, WITH TINCTURE OF ACONITE.

Expt. No. 24.—Eighteen grains of Battley's solution, mixed with one and a half grains Fleming's tincture of aconite, both by weight, were injected under the skin of the back of a large and very strong buck rabbit. It moved about with customary activity for 5 minutes, when it lay prone on its belly. During the next 25 minutes, it occasionally shifted its position in an uneasy manner. After 30 minutes, it lay in same position, disinclined to move, breathing slowly, audibly, and with deep fetches. After 40 minutes, retching movements occurred. The head was maintained in a retracted position. Occasionally it moved a few paces in a crawling manner—staggered, and then came to a stop. After 50 minutes, salivation was observed, but no twitching of lips or chewing movements of jaw. At times spasmodic twitches affected the limbs, and the animal braced itself, as if to avoid falling. After 65 minutes, the breathing was very laborious and slow, being 10 per minute; the nostrils were widely expanded, and the head retracted. After 85 minutes, salivation continued, and the animal was much disinclined to move, but, when lifted, used its muscles

actively. After 90 minutes, when urged to motion, it attempted to do so in the customary manner, by leaps, but staggered, and was evidently paralyzed, particularly in the hind legs. Its manner indicated distress—the breathing was still slow—the head carried erect. After 2 hours, was evidently improving. After 5 hours, was much improved, and capable of moving about in its natural manner.

Expt. No. 27.—Thirty-six grains Battley's solution, with four grains Fleming's tincture, both by weight, was injected under the skin of the back in a small-sized doe rabbit. The animal moved about with fidgety celerity for four minutes, when chewing motions of the jaw took place, with twitchings of the lips. After 7 minutes, the position was half sitting, half crouching, with head erect and retracted—a look of watchful expectancy. A slight degree of salivation was noticed, and occasional retching efforts were made. After 9 minutes, great uneasiness was manifest—the head was strongly retracted, the eyes occasionally closing, stridulous or choking cries were emitted at intervals, and from time to time the animal moved a few paces in a staggering manner, trailing the hind legs. After 12 minutes, it lay prostrate on the side and back—the fore paws raised in the air—the head upturned and retracted—the nostrils widely expanded—the breathing laborious, audible, and performed with deep fetches—the limbs and entire body, with exception of neck, very relaxed. At the 13th minute, there occurred severe opisthotonic convulsions, at intervals the animal bounding upwards in the air like a fish—then propelling itself in darting movements, while still lying on the side, round the interior of the basket cage—then lying with hind legs extended stiffly in a line with the body—the back arched and the head retracted. This convulsive attack lasted one minute and a half, after which followed half a minute of utter prostration, during which the urine was forcibly discharged, and immediately after the animal died quietly—the pupils being contracted during the convulsions, and becoming dilated in the short interval of relaxation preceding death, and again contracting for some time after death; 15 minutes precisely elapsed from beginning of the experiment till death. After death the limbs were quite relaxed. *Rigor mortis* was complete, 40 minutes after death.

PRITCHARD'S BATTLEY.

Expt. No. 32.—Ten grains by weight of Pritchard's Battley was injected under the integument of both flanks of a full-grown buck rabbit, a very small quantity being lost in the operation. During 5 minutes the animal seemed very uneasy, inclining frequently to crawl, but almost immediately, and as if moved by

a new impulse, getting up and shifting to a fresh position. Within the next few minutes it lay down twice very suddenly, with both hind legs freely extended sideways, and carrying the head very erect. After 22 minutes, a strongly marked twitching of the lips and a chewing motion of the jaws began. The animal at same time placed itself in what seemed an attitude of expectancy, or watchfulness—half sitting on its haunches, the fore legs spread in front, and the paws of both fore and hind legs somewhat retracted, so that the weight of the body was supported on the heel, or palmar surface of the feet, the claws protruded a little as if to grasp the floor, the head was thrown back, and the eye expressed alarm. After 23 minutes, it suddenly staggered and fell on its side. Retching efforts now became frequent, and respiration seemed difficult. After 32 minutes, saliva began to flow rather abundantly, and the chewing action of jaws continued actively. At this time the pupils were contracted, the eyelids occasionally drooping. After 35 minutes, the breathing was very laborious, and performed with deep catches. The animal still rested on its side, seemingly unable to vary its position, and when shifted from one to the other side, it retained the position in which it was placed. The head was carried erect and retracted, and the nostrils expanded widely, in correspondence with the laborious respiratory efforts. After 55 minutes, a tetanic convulsion of short duration occurred. At end of one hour, the animal still lay on its side, or flank, but it now made frequent efforts to raise itself, using with greatest power the fore legs. In these efforts it shifted its position and moved in a retrograde manner, as if shrinking from some offensive or threatening object. On being urged to motion, it made staggering and awkward efforts to hobble away. At the end of $3\frac{1}{4}$ hours, it continued in a resting attitude, prone on belly, and with head retracted; the breathing very slow; evidently disinclined to move. The pupils continued contracted, the eyelids occasionally drooping and closing. After 8 hours, was so far recovered as to take food.

Expt. No. 31.—Ten grains by weight of Pritchard's Battley, was injected between the skin and muscles of back of a rabbit six weeks old. Within a few seconds it exhibited marked uneasiness, frequently and in an agitated manner shifting its position. After 3 minutes it lay prone at full length, the hind legs extended laterally, the head erect. After 6 minutes it was roused to exertion, when it crawled about for a few seconds. After 8 minutes the peculiar twitching of lips and chewing action of the jaws, as in foregoing experiment, were observed. Almost instantly after, severe retching movements began, and the head was strongly retracted. After 11 minutes the animal lay prone and fully extended, the breathing laborious and catching, the head

strongly retracted, and the nostrils widely expanding in correspondence with the respiratory movements. After 13 minutes it uttered piteous stridulous, or choking cries, made frequent convulsive leaps, but abortive as if from paralysis, and then lay on its side utterly prostrate. After 15 minutes violent tetanic convulsions came on, the limbs extended in straight line with body, the back arched, and the head extremely retracted. The choking cries became very frequent, and at intervals, as the spasms relaxed, the animal made frantic leaps, bounding from its side, like a stranded fish, upwards. The pupil at this time was contracted, and the cornea sensitive to stimuli. Between the 15th and 19th minutes there was an interval of extreme prostration, during which the limbs were very flaccid and relaxed, and the animal lay in whatever position it was placed. The breathing continued distressingly laborious, but no cries were uttered. At the 26th minute the piteous cries were renewed, and the opisthotonic convulsions recurred with extreme severity, and continued with little interval for about 10 minutes; the animal at times rolling over on its side or back, with fore legs extended in the air, or making struggling abortive leaps, and at intervals of about half a minute lying prostrate, and breathing heavingly, and with evident distress. At this time the animal was sensitive to stimuli, and made efforts when the ears were pulled, or the feet squeezed, or the eye-balls touched. After an hour and three quarters, its condition began to improve, and it was able to crawl a little when urged, but it could only progress a few inches at a time, and that in a crawling hobbling manner. After 2 hours 20 minutes its condition was so far improved that when rolled over on its back it regained its legs, but it was still unable to change its position further than a few inches. It inclined to lie couched, breathing slowly and with effort, the head retracted so that the face looked directly upwards, the eyelids drooping and inclining to close at intervals. After $3\frac{1}{2}$ hours there occurred little change, excepting that there was now more of a torpid condition, and that all tendency to convulsive seizures had passed away. No considerable degree of recovery or return of the natural action of the animal was noticeable until fully 6 hours after the beginning of the experiment.

Expt. No. 33.—Twenty grains of Pritchard's Battley, was injected under the skin of flank of a large and strong full-grown buck rabbit. In a few minutes afterwards it moved about in an uneasy manner, but within 5 minutes it placed itself in a semi-couching attitude, braced up, with head erect and thrown back as if watchful and expectant; the fore paws as if grasping the floor, the toes spread and a little upturned, the claws protruding. After 7 minutes it fell, or seemed suddenly to throw itself on its side, in a staggering, paralyzed manner. During the next 3

minutes it moved occasionally with a hobbling kind of effort, lying down from time to time prone on its belly—its breathing performed with deep fetching action and very slowly. After 11 minutes the peculiar twitching of lips and chewing action of jaws began. The pupils at this time were markedly dilated. After 15 minutes there occurred frequent spasmodic retching. After 20 minutes the animal sought the prone posture, was disinclined to move, even when disturbed and urged; its legs lay sprawling, and, when one of them was drawn from under it, it remained, and there was no effort to regain its former position. The chewing action of the jaws occurred with occasional intervals of cessation. After 40 minutes active salivation commenced. Watched closely for about 2 hours, no further change was observed, and at end of 6 hours it still seemed very ill and refused food; next day it had quite recovered.

Expt. No. 34.—Forty grains of Pritchard's Battley was injected under the skin, partly of both flanks, of a large and very strong full-grown buck rabbit. Within 5 minutes, and after showing active uneasiness, there began a chewing motion of jaws and twitching of lips, the head was strongly retracted, the respiration laborious, the nostrils expanding in correspondence with breathing efforts. During next 2 minutes the animal shifted, and turned its position frequently, but without removing from the same spot of ground. After 7 minutes peculiar stridulous cries were emitted. At end of 8 minutes it staggered and fell, and was unable to recover its legs; its movements evidently quite paralyzed, but the greatest debility was manifest in the hind legs. After 10 minutes there occurred frequent retching efforts. After 13 minutes it made several violent and convulsive leaps, bounding quite from its feet upwards in the air, and these were immediately followed by strong opisthotonic spasms. The pupil at this time was much contracted. This convulsed condition continued 5 minutes, after which the animal lay helplessly on its side, the fore paws extended in the air, the nostrils expanded, the breathing distressingly laborious. The pupils were now dilated, the cornea was sensitive, and the animal winced when the paws were squeezed. After 52 minutes there had occurred no material change, excepting that the breathing was becoming gradually feebler. At the 53rd minute there came on very violent convulsions of an opisthotonic character, during which the animal propelled itself in darting movements twice round the large basket cage in which it was confined; the urine was discharged with force, the limbs suddenly relaxed, and the animal was dead. At the instant of death the pupils were contracted, but gradually began to dilate; the *rigor mortis* began, and was well marked in about 40 minutes.

C.

EXPERIMENTS ON RABBITS IN EDINBURGH.

After the foregoing investigation was completed, it was considered desirable by the Crown authorities that the effects produced upon rabbits by "Pritchard's Battley," and by genuine Battley, should, for the purpose of evidence, be seen by the other medical and scientific witnesses engaged in the case; and with this view Dr. Penny was requested to carry out, conjointly with Dr. Christison, Dr. Maclagan, Dr. Littlejohn, and Dr. Gamgee, in Edinburgh, the requisite experiments with these liquids, and with tincture of aconite.

The experiments, which were four in number, were made with full-grown rabbits, and by injection, as in our trials; but as they formed no part of our inquiry, and were not distinguished by any results different from what we had witnessed in Glasgow, we have not deemed it necessary to give the details of them in a separate form. It will be sufficient to state generally, that the effects in the case of each agent—though more intense in degree and shorter in duration, arising from the largeness of the dose, and therefore not permitting time for the development of some of the minor symptoms—coincided in every essential particular with those exhibited in our own trials, and completely corroborated the conclusions at which we had arrived.

II.—*Two Cases of Uterine Hydatids*. By ROBERT SCOTT ORR, M.D., Physician to the Royal Infirmary, Glasgow.

(Read before the Glasgow Medico-Chirurgical Society, 8th August, 1865.)

I WISH to bring these cases under the notice of the members of the Medico-Chirurgical Society, not that I have anything original to communicate regarding them, but on account of their comparative rarity; also on account of the difficulty of diagnosis which is very generally experienced in determining the real nature of such growths before they are expelled from the uterus, and likewise because they afford me the opportunity of exhibiting to the society some extremely beautiful specimens of uterine hydatids. Some members of the society may be quite familiar with their appearance, but I dare say there are others who have never before seen these morbid growths. With regard to the rarity of hydatid disease generally (I do not now speak of uterine hydatids), I may state that I have searched the reports of the Glasgow Infirmary for the last thirty years, and I only find one case recorded under the