

mixture was stopped, and an astringent one substituted.

On the 26th, the diarrhoea continued; the friction-sound over the heart was less extensive, but still well marked; the pulse had risen to 132. He was ordered half an ounce of brandy with arrowroot every hour. He took freely of nourishment. In the evening, he had had some sleep, and appeared somewhat better. A blister was applied over the heart.

On the 27th, the bowels had acted nine times; he had taken twenty minims of laudanum with chalk mixture after each motion; he had also had eight ounces of port wine, brandy and arrowroot every hour, and two pints of strong beef-tea. The pulse had fallen to 120. The blister had risen; and he said he felt easier about the chest. There was increased dulness in the cardiac region; but no friction-sound was audible. He was ordered a grain and a half of opium at bedtime, and to continue the astringent mixture with ten minims of laudanum only to each dose.

On the 28th, the pulse was 118; the bowels had acted five times. He had taken eight ounces of brandy and six of port wine in the twenty-four hours.

On March 1st, he had passed a good night. The heart was felt beating in the second left intercostal space; the cardiac dulness had increased. Friction-sound was heard on pressure, not otherwise. Another blister was ordered. During the night, he became somewhat delirious; and on the following day, the diarrhoea was increased. A grain of opium was ordered every six hours, and an opiate enema after each motion, instead of the astringent mixture.

On the 3rd, there had been some delirium during the night. The bowels were more quiet, and he appeared much better. The tongue was becoming moist; the skin was cooler; and the pulse had dropped to 102.

On the 4th, the pulse was 100.

On the 5th, it had fallen to 92. He had had only two motions. There was less dulness over the heart; and friction-sound was heard on pressure. He was taking two grains of opium at night, ten ounces of port wine and six of brandy daily, beef-tea, etc.

On the 7th, the bowels were quiet; the pulse was 80; and the tongue was cleaner. The heart-sounds were clear at the base. No friction-sound was audible.

On the 9th, he began to take quinine; and the stimulants were diminished to eight ounces of wine and three of brandy daily, with chop, etc.

He progressed rapidly from this date. On the 18th, the brandy was stopped, and the quinine increased in dose. On the 21st, there was no increased dulness over the heart. No friction-sound was audible. The heart's action, and the situation of its beat, were normal; and the sounds were free from murmur.

He was discharged well on the 24th.

**REMARKS.** The foregoing case presents some features of peculiar interest. The patient had been confined to his bed for a week before admission into the hospital; and we may assume, perhaps, that the pericardial inflammation had existed for that period. He had been put under the influence of mercury; but no beneficial effects had been produced on the disease. The remedy, instead of controlling the inflammation, had given rise to severe diarrhoea, which had produced a condition of extreme exhaustion; and, although opium was largely given after admission, it was several days before the action of the bowels was checked; during that time the patient's state was very critical.

The case serves to show the dangerous symptoms that may be produced by mercury, when its action on the bowels is not controlled, and the value of stimu-

lants in certain pathological conditions, although one of the most important organs of the body is the seat of extensive acute inflammation.

[To be continued.]

## Original Communications.

### ON SANTONINE:

WITH ESPECIAL REFERENCE TO ITS USE IN THE ROUND AND, THREAD-WORM.

By WILLIAM ANDERSON, M.D., Resident Physician to the Birmingham General Hospital.

THE introduction of "santoninum" into the *British Pharmacopœia* was no more than was expected by those practitioners who have for several years been convinced of its efficiency, and especially of its superiority to all known anthelmintics in the treatment of the round worm.

Though known in America and upon the continent, it has been little used in this country, and is not mentioned in some of the more recent works upon the practice of physic. Dr. Fleming, of Queen's College, Birmingham, describes it to me, after an experience of more than five years, as the best of known remedies for the round worm and ascarides; and pronounces it, as the result of his observation, to be decidedly superior to spigelia, of which he has made many trials, and which has been so highly praised by our American brethren.

A correct knowledge of its action and mode of administration must be very important to those living and practising in districts where these worms abound and give rise, as they often do, to symptoms of the most formidable and alarming nature—epileptiform seizures, intense headache, hypochondriasis, and dyspepsia, in their most aggravated forms.

The question has been raised, whether or not the presence of these worms in the intestinal canal is injurious to the economy; but when I mention that last year a case of perforation of the intestine accompanied by fatal hæmorrhage occurred in this hospital, and that many of the cases here are attended with such symptoms as to make the patient's life miserable, and greatly to deteriorate the health, if not lay the seeds of incurable disease, I think that this position will be no longer tenable. Moreover, the remedy is so simple, and tasteless, if not pleasant, as prescribed, and productive of no disturbance whatever, that I am inclined to think that any one who had a well-founded suspicion that his patient was suffering from lumbrici, would be only too glad to avail himself of this easy method of curing what might at any time prove a fatal, and is at all times a loathsome, malady.

The lad mentioned above where perforation took place in the duodenum, had nine lumbrici in his intestines; and patients have presented themselves suffering from the symptoms of the disease, who have passed upwards of a dozen after a few doses of the remedy. One man, after taking five grains of santonine three times a day, passed three worms the morning after taking the medicine, two the same night, and one the morning following—six in all—and was very soon in perfect health, although before he was miserable from headache, sickness, and nervous debility. Many such cases could be quoted where immediate relief has been obtained and no disturbance caused, and it is only in cases where large doses have been used that the drug has caused vomiting, purging, or prostration; the tendency to purging

with moderate doses being never observed in my experience, the bowels being, on the contrary, generally somewhat constipated after the medicine, and requiring gentle purgatives, as castor oil. Several times patients have complained of seeing things green and yellow after the use of santonine; and have been not a little alarmed lest this state of things should continue permanent; but I have never met with a case where they complained of seeing objects red, as is stated by some.

The urine is always coloured of a yellowish-green hue; and I was surprised to find that, on the addition of a few drops of liquor potassæ it is instantly changed to the brightest red colour—a very pretty reaction, which any one can verify with ease for himself.

The dose for adults is from two to six grains, and for children from half a grain to a grain. Dr. Fleming recommends the following formula, which I have found very convenient and vastly superior to any other; although I have been in the habit of giving it three times a day instead of at bedtime, and have not noticed any injurious, but, on the contrary, beneficial—that is, more certain and speedy—effects from so doing.

℞ Santonini gr. ij ad gr. vj; sacchari lactis gr. v.

The patient, having fasted since midday, takes this powder at bedtime, suspended in a tablespoonful of cream; next morning, a dose of castor oil; and this process may be repeated several nights, or until the worms are discharged.

But what I am particularly anxious to direct attention to is the *rationale* of the action of the drug, inasmuch as I regard it, from the peculiarity of its behaviour and relation to the intestinal juices, as a *specific for lumbrici only*; though no doubt useful, both as given by the mouth and by injection (dissolved in a weak alkali), for ascarides.

The salient points to be kept in remembrance, with a view to understanding the theory of its action, are as follows.

1. Santonine is not soluble in water, nor in weak acids like the gastric juice.

2. In all likelihood, it passes through the stomach unchanged, until it meets the alkaline juices of the duodenum, in which it is freely soluble.

3. If properly administered, as with sugar of milk, and suspended in cream, the drug is not rendered soluble, and hence not active as a worm poison until brought into actual contact with its victims in the small intestines.

4. If it were administered already dissolved in an alkaline menstruum, we should incur the risk of its absorption in the stomach before reaching the parasite.

CASE I. H. S., aged 22 years, suffered for two months before coming under treatment as an out-patient, from "dimness in the eyes, low feelings, numbness and mythering in the head", and a choking feeling in the throat, so severe that at times he "thought he should have died." He also complained, on being questioned, of very low spirits and inability to follow his work, that of a nailer. About a fortnight afterwards, he had a fit, undoubtedly, from the description of his friends, epileptiform; and he applied for medical advice, and got six powders, which, however, left him still worse than before. He was confined to bed and miserable; and was induced to come here six weeks after the occurrence of the fit. He was ordered santonine and sugar of milk, of each five grains, three times a day. The result was the removal, to the patient's astonishment, of seven lumbrici, one alive, the morning after taking the powders. A dose of castor oil removed two alive the following morning; three dead the next morning; and one,

also dead, the following night. He says he felt rather lightheaded soon after commencing to take the powders; that he saw things green and yellow at intervals (never red); and that his urine was "yellow like gold."

CASE II. T. S., aged 6 years, admitted on April 25th as an in-patient, had suffered from violent epileptic attacks for several months. I regret that I do not possess accurate notes up to the termination of this child's case, as she left this hospital for London. Though only six years of age, and a pale, anæmic child, she passed no fewer than eighteen lumbrici during the first six weeks of her stay in the hospital; and sixteen of these eighteen were passed after taking santonine, none having been passed after the use of the male-fern, which was given on the suspicion of tænia being present, and only two being removed after turpentine with castor oil.

This case is also interesting from the fact that she was able to take the very large dose of six grains of santonine three times a day; and for one day she took ten grains three times a day, without any other effect than sickness and faintness.

The epileptic attacks continued almost as frequent as before at the time of her dismissal; but, in my opinion, it is by no means improbable that, from the long continued presence of such an irritation as must have been caused by the presence of so many of these immense worms in this little creature, the epileptic habit (if I may so express myself) may have been established. Other remedies, zinc and atropia, had no effect upon the epilepsy.

CASE III. S. J., aged 30 years, married, admitted as an out-patient on December 3rd, 1863, had suffered for three months from pain in the stomach and right side, and from "a choking and rising in the throat and complete loss of appetite"; and having vomited a lumbricoid worm, she applied to a medical man, who prescribed some powders for the worms; but she passed no more worms, and was not at all relieved. She came here on December 3rd, and was ordered five grains of santonine with sugar of milk three times a day, which large dose she continued to take for a fortnight. During these fourteen days, she passed eight or nine lumbrici all dead, and is now in perfect health and free from pain of any kind.

She states that on the first and second days after taking the powders, she almost lost her eyesight and "saw things of all colours", and turned giddy, and was obliged to confine herself to bed, as she felt weak and unable to go about. The bowels were constipated, and she took castor oil. The urine was of a citron yellow, and became of a beautiful crimson colour on the addition of liquor potassæ.

Many cases similar to the above could be quoted; and cases to show the superiority of this drug over the powder of the *artemisia santonica*, which I have given to children in the dose of twelve grains night and morning, with very little comparative benefit. In these cases, the urine was only tinged of the slightest pink on the addition of liquor potassæ; and the patients never complained of any effect upon their eyesight.

The greenish-yellow colour of the urine and the deepness of the red colour on the addition of an alkali (for ammonia, soda, and lime give the reaction as well as potash) bear a direct relation to the strength of the dose.

Dr. E. Rose of Berlin took fifteen grains without injury, and found that twice that quantity was sufficient to poison a rabbit by convulsions and ascending paralysis. (*Archiv f. Path. Anat.*) I have taken small and large doses of the drug without any bad effect; and along with my friends Messrs. Elkington and Birt, have detected a perceptible red tinge in the

urine a very few minutes after taking a dose, showing that this is a substance very easily absorbed. Indeed as it shows its presence in the urine so quickly, it seems reasonable to conclude that some of it, or some constituent of it, must be absorbed even in the stomach, although it is pretty clear that the active part of it is dissolved in the alkali of the duodenum.

If given in the form of solution as santonate of soda, probably more would be absorbed, and the serum of the blood and the urine more intensely coloured; for it has been found partially unacted on in all parts of the intestinal canal, and in the fæces themselves when given alone; but it would not be nearly so efficient when dissolved as a worm poison.

I believe that just as certainly as practitioners will find this drug a *specific and sure poison for lumbrici*, so certainly will they be disappointed if they use it indiscriminately as an anthelmintic in cases, for instance, of tænia, where I have satisfied myself it is decidedly inferior to the male-fern and to kamela. It is, however, as stated above, of service in the thread worm, especially as a weak alkaline injection; in such cases, however, I think I have found as good results from enemata of infusion of quassia (four times the usual strength) with common salt. It is so difficult to get out-patients to manage such matters to one's satisfaction, that I have not yet been able positively to ascertain how far it acts as a direct poison to these very troublesome parasites. It remains a great desideratum to find some anthelmintic which would act for these worms according to the plan of action of santonine for the lumbrici—that is, that would remain comparatively inert just till it met with its victim in its peculiar habitat. To give medicines by the mouth which are acted upon, and consequently act upon the patient during the whole time of their passage through the intestinal tract, for parasites infesting the other end of that tract, is certainly a very roundabout proceeding.

I was induced to try the following experiments upon rabbits, with a view, if possible, to elucidating the physiological action more clearly, and I regret that want of time prevents me at present from following up the very interesting results I obtained as a commencement.

At 5.15 p.m. the duodenum of a rabbit having been ligatured, fifteen grains of santonine were administered. At 6.20 the urine was tested, and gave the characteristic reaction. At 7.40, the rabbit having quite recovered, a scruple of santonine was administered, and at 9.25 the urine was very strongly coloured, and the rabbit gave no symptoms of any disturbance whatever. At 9.45 the ligature was removed, a blood-vessel being accidentally divided and a good deal of shock experienced, from which the creature was only recovered by stimulants, and died some hours afterwards during the same night.

Unfortunately, as is usually the case with rabbits, the stomach was not empty at the time of the operation, and a considerable quantity of food remained, in which a large quantity of the drug was found unacted upon.

A second rabbit had a dose of a scruple, followed at the interval of half an hour by half a drachm, without any injurious, or indeed any visible effect whatever. The next day, the animal appearing in perfect health, was given the large dose of one drachm, still without any apparent effect, and this was followed by a dose of half a drachm in an hour and a half. To my astonishment, these large doses produced still no effect, beyond perhaps a little dulness, which soon passed off when the animal was roused.

Being tired with feeding the animal with the powders, I injected a drachm in suspension again without result, and I regret to say that an accident

destroyed the life of the creature immediately after I had injected a second similar dose, an hour afterwards.

It would appear, then, from both of these experiments, that it requires a much larger dose than thirty grains to poison a rabbit, as stated by Dr. Rose of Berlin, and quoted by others. Secondly, that some of the constituents of the drug are absorbed in the stomach as the colouring matter appeared in the urine, although the pyloric orifice of the stomach was tightly ligatured.

Had time permitted, I wished to try how large a dose it required to prove fatal in the rabbit both in the stomach alone, and when allowed to go through the whole intestinal tract; and as santonine when given in powder has been found unacted upon in the excreta, whether when given in solution it was more active as a poison. These points I hope yet to be able to determine.

We may now expect that, as it has appeared in the *British Pharmacopœia*, more experiments will be made as to its mode of action. I think no one who fairly tries it will refuse to allow it to stand *facile princeps* as an anthelmintic for the round worm, and I hope many will be induced to try it also in other diseases for which it has been recommended; as, for instance, in the uric acid diathesis (in which I have found it of decided benefit), some cases of amaurosis, etc., as it may confidently be hoped that a remedy which exercises such an important influence upon the circulatory and nervous systems, and consequently upon general nutrition, may prove of great therapeutical value.

[To be continued.]

## Transactions of Branches.

### SOUTH-EASTERN BRANCH: WEST KENT DISTRICT MEETINGS.

#### LARYNGO-TRACHEOTOMY IN AN INFANT FOR THE REMOVAL OF A FOREIGN BODY.

By FREDERICK J. BROWN, M.D., F.R.C.S., Consulting-Surgeon to St. Bartholomew's Hospital at Rochester.

[Read April 1st, 1864.]

MARY ANN P., aged 6½ months, residing at Chatham, was seen by me in consultation with another practitioner on May 11th, 1863.

She met with an accident on May 1st. A piece of walnut equal in size to a domestic fly (weighing two grains when dried), was put into the mouth of the infant by another child, and it was carried into the wind-pipe by a sudden inspiration. There was urgent distress at the time, and a recurrence of laryngeal spasm many times daily, subsequently. The object moved freely up and down the trachea, and occasionally impinged against the rima glottidis.

I performed laryngo-tracheotomy at noon, putting the child slightly under the influence of chloroform. I introduced a pair of forceps into the trachea to search for the object. I believe that the trachea became occluded either by the foreign body or by blood, for the child ceased to breathe for one minute.

I handed the infant to its mother to be nursed and suckled, and in three hours' time returned and adopted a method that ought to have been practised at first; viz., I passed ligatures into the fascia on each side of the opening into the wind-pipe, and thus separated the edges. The foreign body was immediately expelled by an expiration. The child speedily recovered.