[*From the* PHARMACEUTICAL JOURNAL *for* MARCH, 1857.]

ON THE DETECTION OF STRYCHNINE IN CASES OF POISONING.

BY DR. J. E. DE VRY,
Lecturer on Chemistry; and

E. A. VAN DER BURG,
Pharmaceutical Chemist of the Rotterdam Hospital.

IN the month of September, 1856, we were required by the *Juge d'Instruction* to make a chemical investigation of the contents of the body of a man, on the cause of whose death there was some suspicion of poisoning. The man having been brought to the hospital in a tetanic state, we were naturally induced to try to find strychnine in the contents of the body; but neither this nor any other poison was to be found, so that the death of this man remained unexplained.

The discordant opinions of several chemists in the famous trial of Palmer, made it necessary, for our own persuasion of the truth, to institute a series of experiments, to make out:—1st. The sensibility of the principal reagents on strychnine; 2nd. The possibility of detecting strychnine with these reagents, if the strychnine is mixed with animal substances; 3rd. If strychnine can *always* be found in the corpse of an individual poisoned by it.

1st. Sensibility of the principal reagents on strychnine: *Chromate of potash or ferridcyanide of potassium and concentrated sulphuric acid.*—By these reagents $\frac{1}{60000}$ of a grain of strychnine can be detected, if one drop of a solution, containing one grain of strychnine in 60,000 grains of water, is evaporated in a small porcelain dish on a water-bath, and the remaining substance moistened with the smallest possible quantity of pure concentrated sulphuric acid. By introducing in this solution a *very small* fragment of a crystal of bichromate of potash or ferridcyanide of potassium, and moving this fragment with a glass rod in the solution, a beautiful dark purple colour is produced on every part of the surface of the porcelain that has been in contact with the acid solution, and the fragment of one of the two salts.

Bin-iodide of potassium, and iodide of mercury and potassium.—By a solution of one of these compounds, $\frac{1}{50000}$ of a grain of strychnine can be detected. These reagents, like the following, possess only the ascertained sensibility, provided the drop of liquid is contained in a capillary test-tube, in which the liquid, although only a drop, forms a small column, in which the formation of a precipitate can be observed by comparison with a similar capillary tube filled with pure water, and mixed with the reagent.

Tannic acid reveals $\frac{1}{25000}$ of a grain of strychnine.
Solution of chlorine in water, $\frac{1}{3000}$.
Sulphocyanide of potassium, $\frac{1}{3000}$.
Neutral chromate of potash, $\frac{1}{3000}$.

The precipitate formed by bin-iodide of potassium is brownish-red, and if dissolved in weak warm spirit, acidulated by sulphuric acid, beautiful crystals are formed of sulphate of iodo-strychnine, which polarize the light, as has been discovered by Mr. Herapath. The precipitate formed by iodide of mercury and potassium, by tannic acid, and by solution of chlorine in water, are white. This last reagent must be used in relative large quantity, and the precipitate formed by it does not appear immediately.

The precipitates formed by sulphocyanide of potassium and neutral chromate of potash are both crystalline. The colour of the former is white, and the form of the crystals observed by the microscope is very characteristic. The colour of the latter is a beautiful yellow. The formation of both these precipitates is accelerated by rubbing the surface of the tube with a glass rod.

The precipitate formed by chromate of potash gets immediately a dark purple colour, if moistened by concentrated sulphuric acid. *All* the other precipitates get the same colour if they are dissolved in a small quantity of strong sulphuric acid, and the solution brought into contact with a fragment of a crystal of chromate of potash or ferridcyanide of potassium.

2nd. The possibility of detecting strychnine, if mixed or combined with animal substances.

In all the following experiments, the method of Professor Stas was used. This method, by which all organic basic poisons can be detected, consists in treating the animal substance which is supposed to contain a poison, with spirit of wine, acidulated by pure oxalic or tartaric acid. The tincture, after having been filtered, is evaporated at a gentle heat on a water-bath, and the remaining substance dissolved in anhydrous alcohol. This solution filtered, and again evaporated, and the remaining substance dissolved in water. The watery solution, after having been filtered and partly evaporated, is saturated with bicarbonate of soda, and afterwards repeatedly agitated with ether, which is made alkaline by a small quantity of caustic potash or soda. If there is any basic organic poison present in the animal substance under examination, it will be obtained by evaporating the ethereal solution, and may be afterwards tested by several reagents to find out its nature.

1st Experiment.—A solution of $\frac{1}{4}$ of a grain of strychnine mixed with 6 ounces of fresh meat. The poisoned meat treated as mentioned, afforded small crystals of strychnine, of which the identity was proved by the reagents mentioned.

2nd Experiment.—The white and yellow of one egg were mixed with $\frac{1}{4}$ of a grain of strychnine, and this mixture coagulated by the heat of boiling water. The coagulum being treated according to Stas's method, *almost the whole quantity* of the strychnine was recovered in white crystals.

3rd Experiment.—The urine of 24 hours from a patient in the hospital, to whom the physician administered every day $\frac{1}{2}$ grain of nitrate of strychnine, was divided into two equal parts, and one of these parts mixed with $\frac{1}{4}$ grain nitrate of strychnine. The two parts treated in the same way as described by Messrs. Graham and Hofmann,* by digesting and agitating during 24 hours with animal charcoal, &c., that part in which $\frac{1}{4}$ grain of the strychnine-salt was dissolved, afforded us crystals of strychnine, *whilst we could not find the least trace in the other part.*

4th Experiment.—On the 15th of September, $\frac{1}{2}$ grain of strychnine was administered to a young dog. Twenty minutes after the introduction of the poison, its action commenced by vehement tetanic spasms, salivation, and

* *Annalen der Chemie und Pharmacie*, Bd. 83, S. 39.

excretion of urine, and ten minutes later the dog was dead.* The stomach, liver, gall, bladder, spleen, kidneys, intestines, and blood were taken from the body and separately examined on the 18th September, when they all were in full putrefaction. The result of this investigation was, that a comparatively large quantity of strychnine was obtained from the stomach, whilst *no one of the other entrails* contained the least trace of this poison.

3rd. Can strychnine *always* be found in the corpse of an individual poisoned by it?

After we had proved that the least trace of strychnine could be detected if it was really present, we desired to get the conviction if poisoning by strychnine could *always* be proved by the aid of chemistry. The following experiments were executed with a view of determining this point:—

1*st Experiment.*—A middle-sized dog was poisoned by introducing a solution of nitrate of strychnine in a superficial wound. Immediately after death 4 ounces of the blood were treated according to Stas's method, but not the least trace of strychnine could be detected.

2*nd Experiment.*—On the 26th September we administered to a small dog weighing about 8 pounds, at 10 o'clock in the morning, $\frac{1}{30}$ grain of strychnine mixed with $\frac{1}{15}$ grain of tartrate of antimony and potash. This dose was repeated twice on the following day, at 9 o'clock in the morning, and at 4 o'clock in the afternoon, without any symptom. On the following day the dose was repeated at 9 o'clock, and again at 12 o'clock in the morning, and at 1 o'clock the dog had a violent attack of tetanus, accompanied by salivation and ejection of urine. This attack lasted some minutes, and was soon followed by a second, which was still more violent. At 3 o'clock the dog got a third, and at 8 o'clock a fourth dose of poison, each of which was followed by an attack of tetanus, one hour after the introduction of the poison. On the 30th of September the situation of the dog was much better compared with that of the preceding evening. At 10, and again at 12 o'clock, a dose of poison was administered, which doses were followed now and then by spasmodic contractions, whilst it appeared that the irritability of the nerves was much increased, for the dog jumped up or trembled at the least noise. At 2 o'clock in the afternoon a third dose of poison was given, which was followed at half-past 2 and half-past 3 o'clock by attacks of tetanus, the latter lasting ten minutes. The fourth dose was given at half-past 5 o'clock. One hour later the dog got the most vehement attack of tetanus, accompanied by salivation and ejection of urine and fœces, which lasted a quarter of an hour, and terminated by the death of the animal. This death was caused by a chronic poisoning, begun on the 26th of September, and terminated on the 30th of September, in which lapse of time the dog got no more than $\frac{14}{30}$ths of a grain of strychnine, and $\frac{28}{30}$ths of a grain of tartrate of antimony and potash, which small dose of poison caused seven attacks of tetanus. After each attack the widely-extended hind feet were much stiffer than the fore feet.

The *post-mortem* examination of the body, which was very carefully performed by the distinguished Assistant-Physician of the Rotterdam Hospital, Dr. Schmidt, proved that there was nothing abnormal to be found which could even lead to the suspicion that death had been caused by the administration of a poison. The chemical analysis of all the parts of the body led to the same negative conclusion, for not the least trace of strychnine could be detected, notwithstanding the great sensibility of our reagents which was proved in the former experiments.

---

* The *same dose* of poison, mixed with half an ounce of animal fat, was administered to another dog of somewhat larger size, for the purpose of testing the assertion of Dr. Pindell, published some time ago in the *American Journal of Pharmacy*, that fat would neutralize the tonic effect of strychnine. The result, however, proved fatal to the animal, which died an hour and a quarter after the ingestion of the poison.

In this experiment, the admixture of fat to the poison had no other effect than to *retard* (and not to neutralize) its mortal effect.

From the alleged facts we may be justified in making the following

CONCLUSIONS.

1. That the method which we pursued for detecting strychnine was adapted to discover the least trace of the poison, for even only $\frac{1}{50000}$ of a grain could be detected.

2. That even when the strychnine is combined with albuminous matter, nevertheless, the *whole* quantity can be separated by the method of Stas, if properly conducted.

3. That if death has been caused by strychnine, this poison can be detected in the body, provided it has been administered in a quantity *more than sufficient* to cause death.

4. That if the poisoning by strychnine has been chronic, and has resulted from a quantity not greater than just necessary to cause death, the cause of this death *cannot be proved*, either by the *post-mortem* examination of the body, or by a chemical investigation of the intestines.

5. That it appears to be highly probable that that part of the strychnine which acts mortally is decomposed in the living body.

6. That the urine of patients who take strychnine or its salts as a medicine, contains not a trace of this poison.

Rotterdam, 8*th January*, 1857.