STRYCHNIA AND HEMLOCK.

The effects of strychnia are very simple; leaving the intellect unaffected, it chiefly seizes upon those parts of the nervous system from which flow the impulses that set the muscles in motion.

These impulses, which in the natural condition of the body result in the ordinary voluntary movements, are placed by the action of strychnia beyond the control of the will. Involuntary twitchings of the muscles and sudden jerkings of the limbs first occur; but if the dose of the poison be sufficient, these soon become general, and the body passes into a state of the most rigid spasm.

We do not observe those alternate contractions and relaxations which in a fit of ordinary convulsions—epilepsy, for example—allow of the bending and straightening of the limbs in rapid succession, but the whole of the muscles of the body are simultaneously locked by violent and continuous cramp.

From common cramp we may get some notion of the agony which racks the whole body of a person poisoned by strychnia. The effects of strychnia resemble those of tetanus (lock jaw) rather than those of epilepsy. The frightful *risus sardonicus* caused by cramp of the facial muscles, is, indeed, an expression common both to strychnia poisoning and to tetanus; and the jaws are as tightly locked in the one condition as in the other.

The rigor thus affecting the muscles of the head rapidly spreads over the whole body, which soon becomes stiffened with spasm and shaken with violent tremor; the trunk meantime is extended to the utmost, the feet are drawn into a straight line with the legs, and, at the hight of the paroxysm, the head is drawn backwards, the back is arched, and the body supported on the heels and the back of the head; the chest is fixed, and the breathing suspended. After a few seconds the cruel spasm ceases, and the muscles, which a moment before felt as hard as wood, are now flaccid and exhausted, and the suspended life returns with a long drawn sigh. Now the poor patient speaks, and in feeble, tremulous accents implores to be left undisturbed, and shudders or even passes into another paroxysm if any one approach him and attempt means for his relief.

Strychnia impresses the whole nervous system with such exquisite sensibility that the lightest touch is sufficient to evoke a fresh discharge of nervous power. Under its influence the nervous system is like an overcharged thunder cloud or Leyden jar; and disruption occurs on the faintest disturbance.

And terrible indeed are these electrical convulsions in the body. The intervals of respite and of seeming rest, but really of dread suspense, become shorter and shorter, and each succeeding discharge is more violent and prolonged. There is no gasping for breath, for the iron spasm holds the chest too rigidly confined to allow of even this niggardly relief. The interchange of gasses in the blood is suspended, the air lies stagnant in the lungs, and the patient is suffocating even more rapidly than if a cord were firmly tied round his neck; the tongue grows purple, the poor heart meanwhile puts forth all its energy, and throbs almost to bursting. It avails not, however; the blood which it so hurriedly distributes wants vital air; and when the storm is over, the body falls lax into the hands of death. Then, if we look to it, we find the muscles torn by the violence of the fatal cramp.

Such are the simple effects of strychnia; and a quarter of a grain taken by the stomach, or the one sixteenth of a grain introduced under the skin, will, in a person of moderate size and strength, produce the whole of them.

And yet the mite of strychnia itself undergoes no change. We may separate the whole of it from the dead body, and therewith reproduce its effects in other living beings. Such, indeed, is the physiological test for strychnia; and it is readily applied. We take a frog fresh from the pond, and having removed the moisture, by means of a piece of blotting paper, from its back, we place thereupon a few drops of the suspected solution. It is soon absorbed, and if strychnia be present, the sensitive little animal is thrown into a state of tetanus.

Strychnia poisons all animals alike, from the tiny insect to the largest quadruped, and the hot blooded bird is as susceptible of its action as the cold blooded reptile. If a wild animal is killed by this poison, the vultures that eat the flesh are poisoned too. For several years past it has been an active instrument in the hands of the suicide and the avicide. Wheat steeped in water embittered by a minute fragment of strychnia and thrown broadcast over our fields has been, and we fear continues to be, the fatal device to which our feathered tribes fall an easy and indiscriminate prey. When will our farmers and horticulturists learn that these little laborers are worthy of their hire, and that the seed they consume is in value nothing as compared with what they save from the depredations of the fly and the canker worm?

We have spoken of strychnia merely as a poison. It is not difficult to see how, in the hands of the physician, its powerful properties may be directed to the relief of disease. As the most powerful excitant of the centers of motion, strychnia becomes the appropriate stimulant when those centers are paralysed. As a tonic it rivals quinine. Strychnia is derived from the nux vomica (*strychnos nux vomica*), a plant of the same natural order as the common blue periwinkles; but the poison abounds in many other species.

HEMLOCK.

From strychnia we pass to a consideration of its opposite, namely, hemlock. No poison claims a higher antiquity or a greater historical interest than hemlock. To the physician, there is none that surpasses it in physiological interest. The bare mention of the plant carries one back to the days of the Grecian republic, and recalls the undying names of Socrates, Theramenes, and Phocion—men who submitted to the baleful influence of hemlock rather than betray the liberty of their country. If we would learn the effects of the Athenian State poison, we may have Plato for our teacher, and for a subject him of whom Cicero justly said "that he was the first who called down philosophy from heaven to earth, and introduced her into the public walks and domestic retirements of men, that she might instruct them concerning life and manners." "Socrates," says Plato, "received the fatal cup without change of countenance or the least perturbation, and then, offering up a prayer to the gods that they would grant him a prosperous journey into the invisible world, drained it with perfect composure. His friends around him burst into tears. Socrates alone remained unmoved. He upbraided their pusillanimity, and entreated them to exercise a manly constancy worthy of the friends of virtue. His executioner directed him to walk about until he should feel his legs becoming heavy. He did so until the chilling operation of the hemlock compelled him to lie down; then it seized upon the more vital parts. The executioner approaching him, said to his friends, that when the effects of the poison should reach the heart, Socrates would depart. Then, uncovering him, he found the lower part of the body was cold. At this time Socrates spoke these his last words to his friend Crito: 'Crito, we owe Esculapius a cock; pay the debt, and do not forget it.' 'It shall be done,' replied Crito; "but consider whether you have anything else to say." Socrates answered not, but in a short time was convulsed. The man then uncovered him; his eyes were fixed; and when Crito observed this, he closed his eyelids and his mouth." In this account, we have ample proof of the action of hemlock. The legs grow heavy, and the chilling effects creep on. The victim, no longer able to stand, lies down; at last the respiration ceases, accompanied, as is usual in such cases, by a slight convulsive tremor, the mind remaining clear and tranquil to the last.

Hemlock is the exact opposite of strychnia. Strychnia excites the organs of motion; hemlock depresses them. Strychnia kills by causing intense and prolonged spasm of the muscles, by whose alternate contraction and relaxation air is drawn into and expelled from the lungs; hemlock kills by causing complete relaxation and paralysis of the muscles.

Here, then, we have two nerve poisons so completely opposed to each other that each is the antidote of the other, and a study of their action furnishes a good illustration of the principles that guide the physician in the administration of an antidote.

The Waste Products of Coal.

In the destructive distillation of coal for the production of ordinary gas, a quantity of offensively smelling water and a considerable bulk of tarry matter are also produced. These were formerly thrown away as useless and deleterious, but now they are utilized.

The noxious odor of the gas water is due to the presence of sulphur and ammonium compounds, and by simply adding sufficient quicklime the alkaline compounds are decomposed, and ammonia gas is liberated. This is conducted into chambers filled with carbonic acid gas, and thus the common salt, known as carbonate of ammonium, is produced. More than 2,000 tuns of this useful chemical are annually made from refuse gas water. If, instead of quicklime, hydrochloric acid be added, sal ammoniac is obtained, from which nearly all the medicinal preparations of ammonia are produced. The quantity of sal ammoniac thus manufactured from year to year, exceeds 4,000 tuns. If, again, sulphuric acid be employed in the place of hydrochloric acid, sulphate of ammonium is the result, about 5,000 tuns of which are annually used for manures. When to a solution of sulphate of ammonium one of sulphate of aluminum is added, the crystalline substance called alum is obtained, so generally useful in the arts. The sulphuric acid used in preparing alum may also be eliminated from gas water. The sulphur impurities referred to before are removed by means of a mixture of sawdust and iron, sulphide of iron and water being produced; air is then passed through the mixture, the effect of which is to convert the sulphide of iron back again into oxide, the sulphur at the same time separating in the form of powder. The sulphur is then burned in a properly constructed furnace, and, by causing the fumes to combine with nitrous and aqueous vapors in leaden chambers, sulphuric acid is obtained.

Let us pass now to the tarry matter, the other waste product of the distillation of coal. This is a very complex body, containing a large number of substances, most of which are volatile, some acid, some alkaline, and some neutral. By appropriate chemical means, these components of crude coal tar are obtained in a state of purity. The lighter portions, known as coal naphtha, consist principally of benzol, a liquid of great utility in the arts. By treating benzol with nitric acid, nitro-benzol is produced, which is used, on account of its sweet taste and almond-like odor, to perfume soaps and flavor confectionery. Anilin, the base of all the dyes bearing that name, is obtained from the action of nascent hydrogen on nitro-benzol. Carbolic acid is another product of the fractional distillation of coal tar. By the action of nitric acid, carbolic acid is converted into carbazotic acid, which is now used as a yellow dye. Perhaps the most interesting of all the products of coal tar is solid paraffin, a colorless crystalline fatty substance, which may truly be termed "condensed coal gas." It is found naturally in the coal measures and other bituminous strata, constituting the minerals known as fossil wax, ozokerit, etc. It exists also in solution in many kinds of petroleum, and may be obtained by distilling off the more volatile portions, and exposing the remainder to a low temperature. The greater bulk of paraffin is, however, obtained from coal tar. The oil produced from paraffin will only burn in the presence of a wick, and is therefore perfectly safe; when burning, it splits up into olefiant gas, thus producing a brilliant white light. To sum up: From the two waste products of coal, in the manufacture of gas, are obtained carbonate, chloride, and sulphate of ammonium, sulphur, and sulphuric acid, coal naphtha, benzol, nitro-benzol, anilin, carbolic and carbazotic acids, and solid paraffin.

The New Liverpool Central tation.

The Central Railway Station, now in progress at Liverpool, is owned conjointly by the Great Northern, Midland, and Manchester, Sheffield, and Lincolnshire Railways. These three great companies, for the purpose of extending their system west of Manchester, have for some considerable time formed an amalgamated committee, known as the Cheshire lines. Besides the above railway, a new and direct line between Liverpool and Manchester is being constructed under the direction of this committee. The Central Station is situated in Ranelagh street, and the front buildings are intended to occupy the whole side of the street between the Lyceum and the Adelphi Hotel. The platforms and other conveniences extend backward from Ranelagh street for the whole length of Bold street, being parallel to that fashionable lounge. Some idea of the extent of the works may be conceived from the fact that over six acres of property have been purchased for the purposes of this terminal station. The booking office and other buildings facing Ranelagh street are now nearly completed. The Italian style has been adopted in the architecture. The main building consists of three stories, and is 142 feet in length, 70 feet in width, and 60 feet in hight. The ground floor is of Tuscan order, with polished grey granite architraves. The first floor is Ionic, with polished red Aberdeen granite shafts and pilasters. The upper storey is in the Attic style, and will when completed be surmounted by a handsome clock turret. The stone chiefly used in the construction is of a fine cream colored appearance, and comes from the Ancaster quarries, in Lincolnshire. Behind the booking office the platform roof is in course of erection, with its supporting walls. Advantage has been taken of the good building stone (of the red sandstone formation) found in excavating for the works, by using it in the construction of these supporting walls. The roof over the platform, 700 feet in length, consists of one main span of 160 feet clear between supports and a side span of varying width. In the construction of this roof, for the purposes of combining strength with lightness, steel has been largely used, and this material, with a certain novelty of arrangement, will make the structure unique and one of the finest in the kingdom. In order to connect the station with the Brunswick Station at the south end of the town, and owned by the same committee, a line of a mile and a half is in course of construction. This line is chiefly in tunnel, with numerous openings for ensuring good ventilation, and passes nearly in a straight line between the two stations. The tunnel is of sufficient width for three lines of rails, and is already completed for the greater part of the distance. The line, it is expected, will be opened in the early part of the ensuing year.

How to Treat Battery Zincs.

The best rolled zinc should be employed; it gives a higher force than cast zinc, and is more economical, because cast zinc is subject to much more local action, owing to its porous condition. Cast zinc rods may be used with equal advantage in cells where they are only exposed to sulphate of zinc, or chlorides of sodium or ammonium, because these do not act by themselves on zinc.

The coating of zinc with mercury prevents the local action of the acid; it appears to effect this by giving a smooth surface, and so favoring the adhesion of hydrogen, which may be seen covering it in little bubbles; therefore, anything which tends to roughness of surface tends to increase local action and waste of zinc and acid, a point the learner should carefully fix in his memory as an axiom. The practical lesson is: keep your zincs thoroughly clean and well amalgamated. Care should be taken to use only pure mercury; much of that sold contains lead and tin, which are mischievous. The mercury should be kept for some time in a bottle, with dilute nitric acid over it, and occasionally shaken up. To amalgamate zinc, wash it first with strong soda to remove grease; then dip it in a vessel of water containing one tenth of sulphuric acid, and as soon as strong action takes place transfer it to a dish (such as a soup plate); pour mercury over it, and rub it well till a bright silver like film orms; then set it up to drain on edge, and before use, rub off any globules which are set free. Whenever the zinc shows a gray granular surface (or rather before this) brush it well and reamalgamate, remembering that saving of mercury is no economy, and free use of it no waste—for it may all be recovered with a little care. Keep a convenient sized jar or vessel solely for washing zincs in, and brush into this the dirty gray powder which forms and is an amalgam of mercury with zinc, lead, tin, etc., and forms roughnesses which reduce the protection of amalgamation. Let this powder collect for a time and then transfer it to a bottle, in which wash it with sulphuric acid first, and then with dilute nitric acid, and you will recover the mercury. This washing should be done whenever a plate is removed, and never less than once a day if in regular use; the cheap brushes are excellent for these purposes, but of course must not be left soaking with acids.

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