

Extract of nux vomica.....	2 scruples.
Mucilage	1 ounce.
Distilled water.....	6 ounces.
Syrup of marsh mallow.....	1 ounce.—Mix.

A table-spoonful every two hours.—*Tr.*]

STRYCHNIA.

The spirituous extract of nux vomica, nux vomica itself, St. Ignatius' bean, the Javanese poison, (the *upas tieuté*),* and the snake-wood, all owe their violent action on animals to two vegetable alkalies discovered by Pelletier and Caventou, one called *strychnia*, the other *brucia*. These alkalies are found in combination with a vegetable acid, the *igazuric*. (See *Ann. de Chim.* 1819.)

Preparation of Strychnia.

Dissolve the spirituous extract of nux vomica in water, and add solution of acetate of lead until all precipitation ceases. On separating the superfluous matter, the strychnia remains in solution with some colouring matter, and sometimes an excess of acetate of lead, which is to be separated by a current of sulphuretted hydrogen; then filter and boil with magnesia, which combines with the acetic acid and gives a precipitate of strychnia and brucia. Wash these in cold water, redissolve in alcohol in order to separate any excess of magnesia, and by evaporation a mixture of strychnia, brucia, and colouring matter is obtained. Macerate the whole in a little weak alcohol, in which the brucia and colouring matter are easily soluble, while the strychnia remains in the shape of a powder, and is taken up by boiling rectified alcohol. Evapo-

* This is different from the *upas anthiar*, causing death by tetanus, whilst the *anthiar* is fatal by producing excessive vomiting. MM. Pelletier and Caventou have extracted a vegetable salifiable base from the last-named plant, which is highly poisonous. (*Ann. de Chim. et de Phys.* t. 26.)

rate, and the strychnia crystallizes. A small quantity of the alcoholic mother-waters should be left in order to withdraw the remains of the brucia. By a second crystallization the strychnia is obtained still more pure. It is, however, almost impossible to get a perfectly pure strychnia from nux vomica, and which does not redden with nitric acid—the sign of its purity. The strychnia procured from the St. Ignatius' bean approaches that state, but the upas tieuté readily affords a perfectly pure substance.

Physical and Chemical Properties.

Strychnia obtained by the above process appears in the form of microscopic crystals, which are four-sided prisms terminated by pyramids with four depressed faces. When rapidly crystallized it is white and granular, is intolerably bitter, and leaves a taste like that of some metallic salts: it has no smell. It is not changed in the air, and is neither fusible nor volatile, melting only at a degree of heat which decomposes and chars it—a degree lower than that at which most vegeto-animal matters are destroyed. Exposed to a naked fire, it swells, blackens, gives off empyreumatic oil, some water and acetic acid, some traces of carbonic acid, carburetted hydrogen, and carbonate of ammonia. Distilled with deutoxide of copper it yields a large quantity of carbonic acid and azote.

According to M. Liebeg, a hundred parts of strychnia give—

Carbon.....	76.43
Azote.....	5.81
Hydrogen.....	6.70
Oxygen.....	11.06

He also found the atomic composition to be C. 30, A. 2, H. 32, O. 3.

Notwithstanding its intensely bitter taste, strychnia is almost insoluble in water, requiring 6667 parts of water for its solution at a temperature of 10°, and 2,500 parts, or less than half that quantity of boiling water.

It is remarkable, that a cold solution of strychnia, which only contains 1-6000th part of its weight may be diluted with 100 times its volume of water, and still be decidedly bitter. The principal chemical characteristic of strychnia is its power of forming neutral salts with acids.

The above-mentioned processes, according to Pelletier and Caventou, show the existence in *nux vomica* of two alkaline principles, one strychnia, the other brucia, which they had already found in the spurious *angustura*. The strychnia should be repeatedly crystallized from alcohol, and is then pure and free from brucia, which being exceedingly soluble in alcohol and difficultly crystallizable, remains in the alcoholic mother-waters. The presence of brucia is however of minor consequence, as its properties resemble those of strychnia, only in minor degree.

M. Henry obtains strychnia by boiling *nux vomica* in water, evaporating to the consistence of a syrup, and adding lime which unites with the igazuric acid, and sets free the strychnia. Alcohol separates the latter from the lime, and it is obtained by evaporation; by repeated crystallization it is purified. This process is good, for it affords a pure and cheap article.

In order to ascertain the presence of brucia with strychnia procured from *nux vomica*, the resinous matter obtained in evaporating the alcohol of strychnia should be treated with sulphuric acid and precipitated from the solution of the double sulphate, whilst still warm, with very weak watery solution of ammonia. The strychnia first precipitates in powder, the brucia subsequently in soft masses: by pouring off the fluid after the first precipitation, a rough separation of the two principles may be effected, and may suffice when manufacturing strychnia in large quantities.

Henry proposes another method of purifying strychnia, by combining it with nitric acid; but the great care that is requisite to prevent the reaction of this acid is an objection to its use. The muriatic or sulphuric acids are preferable. After decolorizing the salt that is formed by animal charcoal, the strychnia is

precipitated by ammonia. At the time Henry proposed this process, the co-existence of brucia with strychnia in nux vomica was not known, and accordingly he makes no mention of the former. When, however, strychnia is obtained by crystallization, it will be free from brucia; when by precipitation, brucia will be present to a considerable extent, and the powers of the remedy diminished.

Unfortunately, the St. Ignatius's bean is seldom found in commerce, for it contains strychnia, according to Pelletier, almost entirely free from brucia.

Action of Strychnia on Man and the lower Animals.

This resembles in all particulars the action of the preceding extract of nux vomica, being only much more violent. The 8th of a grain kills a large dog, and a quarter of a grain has generally a marked action on a healthy man.

Diseases in which Strychnia is used.

Strychnia is applicable in the same cases as the resin of nux vomica, which might indeed altogether supersede strychnia, were it always procured in the same way, and therefore always of a certain strength. From the greater uniformity of the strychnia, I think it is in general to be preferred, the more as I have derived equal benefit from it as from the spirituous extract.

M. Cattaneo has published a memoir in the *Annali Universali*, No. 32, entitled *Della Strychnina, nuovo alcali vegetale*, &c. &c. which contains many interesting facts in relation to its therapeutical effects.

Mode of prescribing Strychnia.

Pills containing one-twelfth or one-eighth of a grain may be made according to this formula:

Very pure strychnia.	2 grains.
Conserve of roses	$\frac{1}{2}$ gros.

Mix accurately, and divide the mass into twenty-four pills.

Tincture of Strychnia.

Alcohol at 36°	1 once.
Strychni	3 grains.

From six to twenty-four drops in any mixture or drink.
I have frequently employed the following mixture :

Distilled water	2 ounces.
Very pure strychnia	1 grain.
White sugar	2 gros.
Acetic acid	3 drops.

A coffee spoonful (eighty minims) to be taken morning and evening.

Strychnia is sometimes combined, as in the following :

Strychnia	2 grains.
Black oxide of iron.....	1 gros.
Powdered sugar and gum, of each	1 gros.

Mix and divide into eight powders.

The subcarbonate of iron may be substituted for the black oxide.

Strychnia may be advantageously used in the endermic method, by blistering the epidermis, and powdering the surface with it. I have frequently done this on the temples in amaurosis and palsy of the eyelids.

Salts of Strychnia.

United with acids strychnia forms crystallizable and for the most part soluble salts—a fact that should be attended to in prescribing it in such beverages as lemonade and other acid drinks. The subcarbonate

of strychnia is of very sparing solubility. The following are some details concerning these salts.

Sulphate of Strychnia is soluble in less than ten parts of cold water, and crystallizes in minute transparent cubes, if neutral, and in needles if the acid is in excess. It is excessively bitter, is decomposed by all soluble salifiable bases, is not altered by exposure to the air, and when heated at a temperature of one hundred degrees it loses no weight, but becomes opaque. At a higher temperature it fuses and falls into a mass, with a loss of three per cent. in weight: further application of heat decomposes it. Its composition is

Sulphuric acid	9.5
Strychnia.....	90.5

According to Dumas and Pelletier, 100 parts of the base saturate 10,486 of acid.

The *hydrochlorate* is still more soluble than the sulphate; it crystallizes, and the crystals appear, through a lens, to be quadrangular prisms: heated to the decomposing temperature of its base, it gives off muriatic acid.

The *phosphate* is only obtained perfectly neutral by double decomposition. It crystallizes in four-sided prisms.

The *nitrate* is procured by dissolving strychnia in very diluted nitric acid; on evaporation it crystallizes in pearly needles. It is much more soluble in warm than in cold water. Its action is even more energetic than that of strychnia.

The acetic, oxalic, and tartaric acids form exceedingly soluble salts with strychnia, which are crystallizable, particularly if the acid be in excess. The neutral acetate is very soluble, and crystallizes with difficulty. Hydrocyanic acid also forms a crystallizable salt with this base.

The subcarbonate is obtained in the shape of white flakes; it is sparingly soluble.

Hydriodate of strychnia is readily obtained by mixing a solution of ioduret of potassium and a concentrated solution of acetate of strychnia, when a pure

hydriodate of strychnia is immediately precipitated as a white crystalline powder, sparingly soluble in water but soluble in alcohol.

A large proportion of acid combined with a small quantity of strychnia would possess the double medicinal property of acting on the nutrition of the organs and of exciting the nervous system.*

Action of the Salts of Strychnia.

These salts, from their greater solubility, are more active, and consequently more poisonous than their base.

Mode of Employment.

When the patient is habituated to the action of strychnia, the salts may be sometimes advantageously substituted for it. I have tried the sulphate, and found it produce decided effects in the dose of 1-12th of a grain in a paraplegic female. I have also for some time past used the iodate with the best results in reputedly incurable cases. (*For the preparation of the iodate, see the article Iodine.*)

I must remark in conclusion, that too much attention cannot be paid by chemists to the preparation and dispensing of these violently poisonous substances.

[Dr. Ryan tells me, he has employed successfully pills of 1-12th of a grain of strychnia in numerous cases of paralysis, paraplegia of long standing, hysteria, epilepsy, chlorosis, dyspepsia, intermittent fever, neuralgia of the scalp, eye, nose, tongue, face, superior and inferior extremities, in chronic rheumatism, gout, and rheumatic gout, and diarrhoea with rice-coloured evacuations which prevailed during malignant cholera. He has observed that few patients bear more than four

* I am at a loss to see any distinction in these actions; any change in the nervous masses or organs must be accompanied with some modification of nutrition in them.—Tr.

or five pills, though the alvine evacuations are regularly induced by aperients during the use of this remedy. He has prescribed strychnia daily in his practice at the Free hospital, St. John's Hospital, the Western Dispensary, Westminster, and for his private patients. He mentions several forms of hysteria, even when the disorder approaches catalepsy, which were cured by it. He has known a few doses of the above pills suppress diarrhœas of fifty rice-coloured evacuations, and when the extremities of the patient were blue. In the former case the medicine caused constipation, which continued for three days. It is remarkably efficacious in neuralgiæ of different parts. It cured epilepsy in young persons after all other remedies had failed to afford relief. Dr. Ryan orders an aperient composed of compound extract of colocynth, calomel, and oil of peppermint, to keep the bowels regular during the use of the strychnia: he has even found the medicine afford alleviation in disorganizations of different parts, which produced pain and disorder in all the other functions. In paraplegia caused by exposure to cold, and without any spinal curvature, which was of fourteen years' duration, and which had been declared incurable, the strychnia afforded such benefit that the sufferer was shortly able to walk with the aid of a cane. This was remarkable, as the patient was a tailor, who was compelled to follow his trade in order to maintain his wife and family. The position of this man at work was injurious to his condition. The remedy is valuable in chlorosis combined with hysteria and the numerous other anomalous symptoms usually attendant on that disorder. The general health is to be attended to at the same time. In the varied forms of indigestion and hypochondriasis, strychnia is valuable combined with other remedies, as with the compound rhubarb pill, blue pill, and a few drops of peppermint oil.

Such a combination is efficient in the milder forms of dyspepsia; but when the bowels are more obstinately constipated, compound colocynth extract may be substituted for the rhubarb pill, and calomel for the blue

pill, a little extract of hyoscyamus being added, to obviate griping and irritation.

Dr. Ryan states, that he has known this remedy fail in relieving all cases of hysteria, neuralgiæ, &c. He also dwells upon the fact, that few patients can bear more than 4 or 5-12ths of a grain daily. He has also employed the different preparations of this remedy, except the iodate or ioduret of strychnia, recommended by M. Magendie. He assures me that he prescribes it daily in twenty cases on an average of his public and private patients, but has never observed it to induce bad effects, when the bowels were properly regulated and the medicine exhibited in appropriate cases.

My learned friend, Dr. Copland, who has made extensive experiments of the uses of this remedy, says, that in cases where the habit of body is greatly debilitated, and where therefore the purely tonic effects of nux vomica and its preparations are required, he has found in general the alcoholic extract preferable to strychnia. Instances of such cases are the amenorrhœa of debility and chlorosis. Of all the kinds of paralysis, he has found strychnia most decidedly beneficial in that arising from lead poison. The local external application of strychnia he has also made, and made with success: rubbed into the temples in cases of amaurosis he has found it answer a good purpose. Cases of success, with a similar treatment, may be found in the Medical Gazette, vol. v. p. 541—575.

Together with Dr. Badgley, of Kensington, I have seen the benefits arising from the use of strychnia, in epilepsy; in the case in question the patient was a robust, full-blooded man, and the remedy was given after sanguineous and alvine depletions.

I have known strychnia put a stop to a most inveterate hiccup of some weeks continuance. I am at this time using it in a case of catalepsy, and with marked advantage; the patient is a young lady of highly hysterical temperament and great cerebral developement, yet none but good effects result from a grain given in the course of thirty hours.

Further and numerous observations of British practitioners on this remedy may be found in Bardsley's Hospital Reports, and the Transactions of the Midland Association, vols. i. and ii., to which the nature of the present work does not allow me to do more than refer the reader.

The French practitioners do not appear to have gone beyond paralysis in their application of nux vomica.

Long ago, Linnæus conjectured the highly tonic powers of the strychnos nux vomica, from the intense bitterness of its aqueous solution.—*Tr.*]

BRUCIA.

This organic salifiable base was discovered in 1819, by Pelletier and Caventou, in the bark of the spurious angustura (*brucea antidysenterica*,) in which it is combined with gallic acid. They subsequently found it in combination with strychnia in the nux vomica. In the St. Ignatius's bean and the upas tieuté, the brucia bears the same relation to the strychnia, which cinchonia does to quinia; the more active cinchonas containing the most quinia, just as the bean and the upas tieuté, which are much more active than the nux vomica, contain only a small proportion of brucia, and a large quantity of strychnia, which, in the upas, is nearly pure.

Preparation of Brucea.

It is obtained from the bark of the angustura, by a process resembling that for the extraction of strychnia, only, that in the case of brucia the magnesian precipitate is to be much more sparingly washed with water, the brucia being more soluble in that fluid than strychnia. By evaporating the alcoholic liquors in which