

ETHER BY THE HYPODERMATIC METHOD.—Within the past few years, the subcutaneous injection of ether has taken an important position in therapeutics. It is necessary, therefore, to enter into this subject fully.

When ether is injected beneath the skin, more or less burning pain is felt at the point of insertion, and a puffy swelling is produced. In most subjects this swelling subsides in an hour or two, and no trace is left of the operation. In some instances, an induration, the size of a filbert, forms, and slowly disappears. Very rarely inflammation is set up about the site of the injection, and followed by suppuration, with more or less sloughing. If not too large an amount, suddenly and violently injected, is used, there will be no untoward results.

The effects of ether subcutaneously are the same in kind as, but more powerful in degree than, those produced by the stomachal administration. A local anæsthetic impression is made; in a few seconds, the action of the heart is powerfully increased, and soon the usual cerebral effects are manifest.

Ether was first employed subcutaneously by Dr. Comegys, of Cincinnati, in the treatment of *sciatica*. He injected from fifteen minims to a half-drachm, in the neighborhood of the affected nerve. This practice has been followed by others with success, and is now more or less widely used as a substitute for "the deep injection of chloroform." It is very desirable to have some exact observations which will determine the comparative value of these expedients.

The most important applications of ether, hypodermatically, are as a cardiac stimulant in the case of sudden and extreme depression of the heart, and as a general stimulant in adynamic states. In the depression caused by *hæmorrhage*, whether pulmonary or *post partum*, the injection of ether may obviate the necessity for transfusion. This practice is strongly urged by Peter, Féréol, and Mlle. Ocoumkoff, who report cases in confirmation. Remarkable results have been effected by the subcutaneous injection of ether in *adynamic pneumonia* (typhoid pneumonia), as practiced by M. Barth. Thus, of fourteen cases of severe type treated by these injections, eleven were cured. The quantity injected was about fifteen to twenty minims two, three, or four times a day, according to the degree of adynamia. The effects which follow almost immediately are these: the respiration becomes more easy, the pulse takes on more strength and volume, the tongue moistens, and the countenance assumes a better appearance. In from two to three minutes after the injection has been practiced, the odor of ether is recognizable in the breath (Barth).

In the eruptive fevers, especially in *variola*, the injections of ether have been used with admirable results (Castel). It is in a high degree probable that the same treatment will prove very useful in low forms of septic and inflammatory diseases in general. There can scarcely

be any doubt that we have in this method a most useful addition to our therapeutical resources.

In place of ether, hydrobromic ether has been utilized in the treatment by the subcutaneous method of various spasmodic diseases, as *whooping-cough*, *chorea*, *asthma*, and similar affections.

Chloroformum.—Chloroform. *Chloroforme*, Fr.; *Chloroform*, Ger.

Chloroformum Venale.—Commercial chloroform. A liquid containing at least 98 per cent of chloroform. It has nearly the same sensible properties as purified chloroform. Its specific gravity should not be lower than 1.470.

Chloroformum Purificatum.—Purified chloroform. A heavy, clear, colorless, diffusible liquid, of a characteristic pleasant ethereal odor, a burning sweet taste, and a neutral reaction. Soluble in about two hundred parts of water, and in all proportions in alcohol or ether; also in benzol, benzin, fixed or volatile oils. Sp. gr. 1.485–1.490 at 60° Fahr.

If five cubic centimetres of purified chloroform be thoroughly agitated with ten cubic centimetres of distilled water, the latter, when separated, should not affect blue litmus-paper (absence of acids), nor test-solution of nitrate of silver (chloride), nor test-solution of iodide of potassium (free chlorine). If a portion be digested warm with solution of potassa, the latter should not become dark-colored (absence of aldehyde). If a few cubic centimetres be permitted to evaporate from blotting-paper, no foreign odor should be perceptible after the odor of chloroform ceases to be recognized. (U. S. P.)

When shaken with an equal volume of sulphuric acid, in a bottle closed by a glass stopper, and allowed to remain in contact twenty-four hours, no color is imparted to either. When one fluid drachm is evaporated spontaneously with one drop of a neutral, aqueous solution of litmus, the color of the latter is not reddened. The result of the test is the same if the chloroform contained in a white glass bottle has been previously exposed to direct sunlight for ten hours.

Mistura Chloroformi.—Chloroform mixture. Purified chloroform, eight parts; camphor, two parts; fresh yolk of egg, ten parts; water, eighty parts. M. Dose, a tea to a tablespoonful.

Spiritus Chloroformi.—Spirit or chloroform. Purified chloroform, ten parts; alcohol, ninety parts. Dose, ʒ ss—ʒ j.

ANTAGONISTS AND INCOMPATIBLES.—Chloroform separates from the mixture when prescribed with weak spirits or glycerin. It is soluble in alcohol (ten to six), in ether (one to seven), in water (one to two hundred). It dissolves very freely in olive-oil and turpentine, but does not dissolve in or mix with glycerin. It has very extensive solvent power, dissolving caoutchouc, gutta-percha, mastic, tolu, benzoin, copal, among the gums; iodine, bromine, the organic alkaloids; fixed and volatile oils, resins, and fats. In cases of poisoning by the inter-

nal administration of chloroform, the treatment should be conducted on the same plan as for irritant poisons. There is no chemical antidote. To overcome its effects on the respiratory and circulatory systems, artificial respiration, cold affusion, and galvanism, may be employed.

SYNERGISTS.—Anæsthetic agents, opium, chloral, alcohol, etc., promote the action of chloroform.

PHYSIOLOGICAL ACTIONS.—The taste of chloroform is hot, sweetish, and pungent. Undiluted it excites violent irritation and inflammation of the mucous membrane. In passing through the fauces the vapor may enter the larynx in such quantity as to cause great heat and inflammation, followed by œdema. In the stomach, chloroform produces a feeling of warmth, followed by coldness, like ether; but, when taken in large quantity undiluted, violent gastritis. Besides the local action, chloroform diffuses into the blood, and affects distant parts. Like alcohol and ether, it increases the action of the arterial system, and occasions excitement of the brain, followed by sopor. In lethal doses profound stupor and insensibility are produced by it.

THERAPY.—A little chloroform (℥ ij—℥ v), dropped on sugar and swallowed, will remove some kinds of *nausea and vomiting*. It can be useful in non-inflammatory states only, as, for example, *sea-sickness*, the *vomiting of pregnancy*, *sick-headache*, etc. *Gastralgia* may sometimes be relieved in the same way. The following formula is an effective remedy for *flatulent colic*: ℞ Spirit. chloroformi, tinc. cardamomi comp., āā ℥ ij. M. Sig.: *A teaspoonful every half-hour in water*. Hepatic and saturnine colic are also benefited by chloroform, but the addition of opium increases its efficacy, and is usually necessary in these cases. Chloroform is a solvent of *biliary calculi*, and has been prescribed with the view to effect a solution of calculi contained in the gall-bladder, or lodged in the hepatic duct. It undoubtedly affords some relief, but not probably because of its solvent action. As has been remarked of ether, it is in the highest degree improbable that sufficient chloroform, even when it is administered in large doses, can reach the calculus to effect its solution, when experiments out of the body have shown that some hours are required to dissolve a calculus immersed in chloroform. In *irritable ulcer of the rectum*, and *itching about the anal region*, an ointment of chloroform gives great relief: ℞ Ung. zinci oxidi, ℥ j; chloroformi, ℥ j. M. Ft. ung. The vapor of chloroform may be applied directly to these parts.

In *hay-asthma*, *whooping-cough*, *spasmodic asthma*, *irritable reflex cough*, the vapor of chloroform may be used as follows: To a cup of warm water, 80° to 100° Fahr., add a teaspoonful of spiritus chloroformi, and repeat every five minutes. This inhalation should not be used except in the presence of a medical man, and not more than five teaspoonfuls should be inhaled at a time. The patient should inhale

the vapors as they arise, directing them into the air-passages from the cup by a paper shield. A little chloroform (a minim or two) is a useful constituent of *expectorant mixtures*, when a neurôtic element is present.

Chloroform is a very valuable hypnotic in *delirium tremens*. It is unsafe when used by inhalation in the treatment of this affection, but, by the stomach, not unfrequently excellent results are obtained from it. It is contraindicated when there are a vigorous action of the heart and an elevated state of the arterial tension, and useful when symptoms of depression and adynamia are present. It should be given in the form of the spirit. ℞ Spirit. chloroformi, tinct. capsici, āā ℥ j. M. Sig.: *A teaspoonful in water every half-hour, hour, or two hours*.

Neuralgia.—Chloroform is extremely valuable in the treatment of this disease, and it is the most effective when used by the method of "deep injection," first proposed by the author. This plan of treatment consists in the injection deeply, *in the neighborhood of the affected nerve*, of five to fifteen minims of pure chloroform. The official spirit of chloroform, ether, or even alcohol, may be used for this purpose. The first named, in the quantity of fifteen minims, is probably the best. Rarely does any local mischief result from these injections, except a temporary induration. The author has procured by this means apparently permanent relief to long-standing cases of neuralgic pain (*tic-douloureux*) affecting the superficial divisions of the fifth. Other practitioners have been equally successful, and the cases thus treated now include neuralgic affections of the most important nerves.

Pain in superficial nerves may sometimes be relieved by the local application of chloroform. ℞ Chloroformi, tinct. aconiti rad., āā ℥ ss; liniment. saponis, ℥ j. M. Sig.: *Liniment*. A piece of flannel, moistened with this, is applied to the painful part, evaporation being prevented by a covering of oiled silk. The pain of *dysmenorrhœa* is relieved by the local application of chloroform-vapor, and of *sciatica*, *lumbago*, *myalgia*, and similar affections, by chloroform applied directly to the parts. *Nervous headache* may sometimes be cured by a little chloroform in a watch-glass applied to the temple.

An impending *paroxysm of intermittent* may be prevented by a full dose of chloroform (℥ j—℥ ij) administered before the onset of the chill. The inhalation of chloroform is used for the same purpose.

A few drops of chloroform, frequently repeated, is an excellent means of relief in *cholera*. It allays nausea and vomiting, arrests diarrhœa, relieves the cramps, and restores the temperature. It may be given in the form of spiritus chloroformi, or of chlorodyne, a very celebrated empirical remedy. No single remedy has been more efficacious than chlorodyne in the treatment of true cholera.

Chloroform as a Counter-Irritant.—When chloroform is applied to the skin and evaporation prevented, it causes heat, redness, and even vesication. Frequently, chloroform is used locally to produce this effect, but usually in combination with other counter-irritants. ℞ Chloroformi, ol. terebinthinæ, āā ℥j; lin. saponis, ℥ij. M. Sig.: *Liniment.* ℞ Chloroformi, lin. camphoræ, āā ℥j. M. Sig.: *Liniment.* These are elegant counter-irritant applications, in cases requiring the milder remedies of this class, and are used in various internal inflammations and local affections characterized by pain. Commercial chloroform can be used in preparing them.

Chlorodyne.—This empirical preparation is largely used in cholera, and in painful diseases requiring an anodyne. Numerous formulæ have been published, but none of them appear to possess the exact qualities of the original preparation by Dr. J. C. Browne. The dose of the genuine chlorodyne ranges from ten to thirty drops. The following formula makes a product more nearly resembling the original than any other known to the author:

Chloroform	4 ounces.
Ether	1 ounce.
Alcohol	4 ounces.
Treacle	4 ounces.
Extract of licorice	2½ ounces.
Muriate of morphine	8 grains.
Oil of peppermint	16 minims.
Sirup	17½ ounces.
Acid. hydrocyan. dil.	2 ounces.

Dissolve the muriate of morphine and the oil of peppermint in the alcohol, mix the chloroform and ether with this solution, dissolve the extract of licorice in the sirup, and add the treacle; shake these two solutions together, and add the hydrocyanic acid. Dose, five to fifteen minims.

Some of the published formulæ contain resin of cannabis Indica, atropine, perchloric acid, in addition to the ingredients above given.

Another chlorodyne, known as "Gilman's," has many advantages, and is now widely used. Its composition is as follows: ℞ Chloroformi purificati, ℥ij; glycerini, ℥ij; spts. vini rect., ℥ij; acid. hydrocyanic. dil., ℥ij; tinct. capsici, ℥ij; morphinæ muriatis, gr. viij; syrui (treacle), ℥iij. M. The dose of this chlorodyne for an adult is a *teaspoonful*. In prescribing the various mixtures known by the common name—*chlorodyne*—the strength should be ascertained before administering.

The following formulæ (Fox) are very efficacious in the local affections for which they are recommended:

℞ Chloroformi, ℥vj; cucumber cerate, ℥j. M. Sig.: *Ointment for pruritus.* ℞ Plumbi carbonat., ℥ss; chloroformi, ℥iv; ungu. aquæ rosæ; ℥j. M. Sig.: *Ointment for pruritus.* ℞ Chloroformi,

℥ viij; glycerin., ℥j; ungu. simplicis, ℥vj; potassii cyanidi, grs. iv. M. Sig.: *Ointment for pruritus.* ℞ Morphina acetat., 1 part; chloroform, 8 parts; lard, 60 parts; oil of sweet almonds, 40 parts. M. An ointment to be applied several times a day in *pruritus pudendi*.

Authorities referred to:

BARTHOLOW, DR. ROBERTS. *On the Deep Injection of Chloroform for the Relief of Tic-Douloureux.* *The Practitioner*, July, 1874, p. 9.

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HUSEMANN, DR. THEODOR. *Handbuch der gesammten Arzneimittellehre*, zweiter Band, 1869.

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ANÆSTHETICS AND ANÆSTHESIA.

Æther Fortior.—The stronger ether.

Chloroformum Purificatum.—Purified chloroform.

Neither of these anæsthetics should be used until its conformity to the standard of the United States Pharmacopœia has been ascertained. The tests of purity are given under their respective heads in the preceding article.

The term *anæsthetic*, proposed by Dr. Oliver Wendell Holmes, means an agent capable of producing *anæsthesia*, or insensibility to pain. It is true, *anæsthesia* is a term which, according to its etymological signification, should be applied to loss of sensation of touch, chiefly, and *analgesia* should be used to signify loss of the sense of pain; but the word *anæsthesia*, as expressive of the state of profound unconsciousness induced by anæsthetics, is now so firmly established by usage that it were better to retain it. Insensibility to pain (*analgesia*) may be produced, without simultaneous loss of common sensation, touch (*anæsthesia*). By the inhalation of ether, chloroform, bichloride of methylene, nitrous oxide, and some other agents, the functions of animal life can be so far suspended that surgical operations involving intense pain, and certain natural processes, accompanied by great suffering, can be performed entirely without the consciousness of the subject concerned.

PHYSIOLOGICAL ACTIONS.—When the vapor of ether or chloroform is inhaled, a sense of faucial irritation and of the need of air is experienced, and more or less cough is produced. The irritation of the fauces excites the flow of mucus, and the reflex act of swallowing. The feeling of need of air causes the patient to push aside the inhaler or sponge, and in children may lead to violent struggling. The sensibility of the glottis is soon diminished, the coughing ceases, and the inhalation then proceeds quietly.