

Incompatibles.

Incompatible with *Aconite* are: Acids, Alkalies, or Water (hot). Atropine, Digitalis, Morphine, Scopolin, and Strychnine, are physiologically incompatible with Aconitine.

PHYSIOLOGICAL ACTION.

The taste of *Aconite* is bitter, acrid and pungent. Soon after the ingestion of even a small quantity, a sensation of numbness and persistent tingling are felt in the tongue and lips. Full medicinal doses cause a sense of constriction in the fauces, irritation of the gastro-intestinal mucous membrane with increased secretion; sometimes nausea and vomiting, and severe pains in the joints and muscles; always more or less salivation, diaphoresis and diuresis; reduced respiratory power, cardiac rate and force; lowered arterial tension and temperature.

A lethal dose produces great muscular weakness, dim sight, dilated (sometimes contracted) pupils; shallow, irregular, and labored respiration, slow and weak pulse, cold surface, clammy sweat, great anxiety, numbness and tingling in the extremities, lowered body-temperature (2° to 3° F.), abolished sensation, impaired reflexes and motility, and finally death from paralysis of the heart and respiration, with or without convulsions, consciousness being preserved until near the end, when CO_2 narcosis sets in. In two recorded cases, edema of the entire body resulted from eating the leaves of the growing plant.

Aconite is rapidly absorbed and the active principle is destroyed by oxidation, so that its medicinal effects do not last long and it may be administered in small doses at frequent intervals. The effects of a full dose continue for three or four hours. Applied externally it paralyzes the sensory nerves of the part, and causes its characteristic numbness and tingling.

The action of *Aconite* is due to its chief constituent, Aconitine, which is the most powerful alkaloid known, and fatal to man in the dose of gr. $\frac{1}{20}$. Its dominant action is depressant to the peripheral nerve terminations, especially those of the sensory nerves, but stimulant to the vagus roots, slowing and steady- ing the action of the heart and lowering the blood-pressure. It slows the respiration, relieves pain, lowers the body temperature, is mildly diaphoretic and feebly diuretic. In overdose it paralyzes both the motor and sensory nerves—the sensory being affected first and from the periphery inward, while the motor nerves are affected from the centres outwardly. It stimulates at first but soon relaxes the inhibitory apparatus of the heart, and paralyzes finally the vagus ends, the cardiac muscle and its contained ganglia, the respiratory centres, and the spinal cord in all its functions—sensory, reflex and motor; but does not affect the cerebrum.

The primary stimulation which the drug produces upon the vagus centre in the medulla slows the heart-rate at first; but its depressant action upon the motor cardiac centres and the vagus end-organs in the heart is soon manifested, and finally the vagus centre shares in the increasing paralysis, which affects the vaso-motor centre as well as the cardiac nervous apparatus. The

heart-rate becomes very rapid near the end, from paralysis of the vagus terminals in its structure. Death is due generally to paralysis of the respiratory centre, sometimes to cardiac failure.

Benzaconine may be resolved into aconine and benzoic acid. It is only $\frac{1}{50}$ th as toxic as Aconitine, depresses the motor nerves, the vaso-motor centre, and the cardiac muscle, but does not paralyze the sensory nerves. It stimulates the vagus, causing slowing of the pulse, and affects the cerebrum, causing a semi-comatose condition.

Aconine is a feeble agent, being 2000 times less toxic than aconitine. In quantity it has a paralyzant action on the motor nerve terminations like that of Curare, does not affect the vaso-motor centre, but stimulates the vagus roots and strengthens the ventricular systole.

THERAPEUTICS.

Aconite was well known to the ancients, by whom it was regarded as the most virulent of all poisons. It was introduced into medicine by Baron Störck, of Vienna, in 1762, and its pharmacology and therapeutics were the subject of an essay by Fleming in 1844, for which he was awarded a gold medal by the University of Edinburgh.

Aconite antagonizes the fever process, and rightly used is therefore one of the most valuable drugs we possess. It has well been called the "therapeutic lancet," and is certainly responsible to a great extent for the disuse of venesection. Its power over the circulation, respiration and transpiration renders it of the greatest value in all affections characterized by a high, resisting pulse, a dry, hot skin, and elevated body-temperature. The chief indication for its use is vascular excitement in sthenic subjects; it is contra-indicated when there is adynamia, weak action of the heart, cardiac degeneration or dilatation, and gastro-intestinal irritation or inflammation. *Aconite* is not a remedy for use in continued fevers, and its prolonged administration is not indicated except under very exceptional circumstances. Even in the inflammatory and febrile conditions for which it is usefully employed it will be found of greatest value in their early and sthenic stages, its later use being often injurious.

Aconite is very efficient in acute affections of the bronchial mucous membrane, in coryza, tonsillitis and asthma due to exposure, also in both catarrhal and spasmodic croup. One of the best methods of "breaking up a cold" is to administer small doses of the tincture at frequent intervals for several hours, followed by 10 grains of Dover's powder at bedtime. As a febrifuge and sedative it is useful in simple and catarrhal fever, also in scarlatina, measles and erysipelas. In the early stage of acute inflammations of serous membranes, as meningitis, pleurisy and pericarditis, it has great power for good, but its employment in these affections should be restricted to the period before the stage of effusion. In acute peritonitis it is a valuable adjunct to Opium in cases presenting the sthenic characteristics which indicate its employment. In the

early stage of pneumonia its sedative influence upon the respiration may be utilized with benefit, but it should not be used beyond the time when the heart begins to undergo much strain. In acute articular and muscular rheumatism it is frequently of great service, and if used from the beginning of the attack in rheumatic fever it will generally prevent the cardiac complications which are so dreaded in that disease.

Aconite has proved very efficient in neuralgia, especially if the attack is accompanied by high vascular excitement, also when the branches of the fifth nerve are affected. Aconitine has proved remarkably efficient in trigeminal neuralgia of obstinate character, but it is a doubtful and dangerous agent for internal use, on account of its variable purity and composition, and its great toxicity. Aconite gives satisfaction in the treatment of cardiac affections characterized by overaction or hypertrophy and absence of dilatation or valvular lesions, particularly in exophthalmos, nervous palpitation, and tobacco heart. Even when valvular disease is present it may be cautiously used in extreme hypertrophy to control the forcible cardiac action.

When diarrhea or dysentery follows a chill and can be ascribed to cold and exposure, the patient having high fever and cutting pains in the abdomen, Aconite will be found a very serviceable remedy. In sudden suppression of menstruation following a chill, getting the feet wet, or similar evidences of exposure, this agent is efficient in removing the discomfort and causing the reappearance of the flow. In congestive dysmenorrhea it frequently gives marked relief. In the early stage of gonorrhoea drop doses of the tincture, given hourly until some physiological effect is produced, will lessen the severity of the inflammatory symptoms and prevent chordee. In the so-called urethral fever it is highly recommended, and a drop or two of the tincture given immediately after the passage of a urethral sound will prevent the chill which often succeeds that operation.

Externally, Aconite is used with benefit as a local anodyne in superficial neuralgias, herpes zoster, pruritus and chilblain. For the relief of vague, wandering pains in the limbs, liniments containing this tincture will prove more effective than those of any other form. For odontalgia the tincture may be rubbed on the gum in the vicinity of the aching tooth, or it may be introduced upon a pledget of cotton into a dental cavity. Any preparation containing this drug should be used with great caution upon an abraded cutaneous surface, as it is rapidly absorbed by the unprotected derma.

Aconite is best administered in small doses of the tincture well diluted and frequently repeated. Doses of $\frac{1}{8}$ to $\frac{1}{2}$ every 15 minutes give better results than larger ones at longer intervals.

ADEPS, Lard,—is the prepared internal fat of the abdomen of the hog, *Sus scrofa*, purified by washing, melting and straining. It occurs as a soft, white, unctuous solid, of bland taste and neutral reaction, entirely soluble in

ether, benzin, and bisulphide of carbon; composed of 38 per cent. of stearin and margarin, and 62 per cent. of olein. Lard forms 50 per cent. of Ceratum, and 80 per cent. of Unguentum, and enters into the composition of several of the official cerates. Fats are formed of the principles *Stearin*, *Margarin*, and *Olein*, which are salts of stearic, margaric, and oleic acids, with the common base glycerin, and contain also odorous and coloring principles.

The action of the Oils and Fats is described under *MORRHUE OLEUM*. Lard is only used as an ingredient of ointments and cerates. Lard Oil has been proposed as an inferior substitute for Cod-liver oil in cases where the taste of the latter is particularly offensive.

Preparations.

Adeps Benzoinatus, *Benzoinated Lard*,—has 2 per cent. of Benzoin in powder, incorporated by stirring.

Oleum Adipis, *Lard Oil*,—is a fixed oil expressed from lard at a low temperature.

Official Derivative and Analogues.

Acidum Stearicum, *Stearic Acid*,—is an organic acid, usually obtained from the more solid fats, chiefly tallow. In its impure, commercial form, it occurs as a hard, white, glossy solid, odorless, and tasteless, permanent in the air; insoluble in water, soluble in 45 of alcohol, also in ether. It is used as a substitute for wax, and is an ingredient of the Suppositoria Glycerini. Stearates of Atropine, Morphine, Cocaine, Copper, Mercury and Zinc are on the market, that of Zinc being the only official one, and the most generally used. [See under *ZINCUM*.]

Adeps Lanæ, *Wool-fat*,—is the purified fat of the wool of sheep, freed from water. It is insoluble in, but miscible with, large quantities of water, sparingly soluble in alcohol.

Adeps Lanæ Hydrosus, *Hydrous Wool-fat (Lanolin)*,—is the purified fat of the wool of sheep, mixed with not more than 30 per cent. of water. A yellowish-white, ointment-like mass, having a faint, peculiar odor; insoluble in water, but miscible with twice its weight thereof.

Under the name *Lanolin* this substance was in use for several years before it became official. It is a cholesterin fat, and a very old medicament, having been mentioned by Ovid, Herodotus, Pliny and Aristophanes; yet the process of obtaining it from the suds from the washings of sheep's wool is patented in this country by Liebrich. It differs from all other fatty substances chiefly in resisting saponification and the action of water, having no tendency to become rancid; and readily passes through the integument, carrying with it any medicament with which it is charged. It is a perfectly neutral base, and therefore not liable to decompose any ordinary substance. The difficulty about its use has been its very disagreeable sheepy smell, but recent samples seem in great measure to be devoid of this objectionable quality. It is particularly useful in chronic skin diseases where there is infiltration, and where a penetrative action is desired for medicaments locally applied. In a few cases of acute and subacute eczema it has proved irritating, but as a rule it is perfectly bland. Where a simple protective action alone is desired it is inferior to Lard, Vaseline or Cold Cream.

Cetaceum, *Spermaceti*,—is a peculiar, concrete, fatty substance obtained from the head of the sperm whale. It occurs in white, pearly masses, which are odorless, of bland taste and neutral reaction, becoming rancid in the air, soluble in ether, chloroform, carbon disulphide and boiling alcohol. It is a constituent of—

Unguentum Cetacei, *Spermaceti Ointment (B. P.)*,—has of Spermaceti 20, White Wax 8, Almond Oil 72, Benzoin 2. The last-named ingredient renders the ointment irritating, and should be omitted when a perfectly bland application is required.

Unguentum Aquæ Rosæ, *Ointment of Rose Water, (Cold Cream)*,—contains Spermaceti, Almond Oil, Rose Water, etc. [See under *ROSA*.]

Spermaceti consists of *Cetin* (Cetyl Palmitate) with several other fats in small quantities. Its action is solely that of an emollient, and it is rarely used internally, though an alcoholic preparation was once a regular prescription for coughs, bronchial irritation, and for a recently delivered woman. A Cerate is employed as a bland ointment for blisters, abrasions and ulcers, but it is too stiff for easy application, and the Ointment is preferred in practice.

The latter on lint to broken blisters from walking affords great relief, and may be smeared on the feet to prevent injury from a rough tramp over broken ground.

Sevum Præparatum, Prepared Suet,—is the internal fat of the abdomen of *Ovis Aries* (the Sheep), purified by melting and straining. It should be kept in well-closed vessels and not used after it has become rancid, as it will on exposure to air. It is a white, smooth, solid fat, of bland taste and neutral reaction, insoluble in water or cold alcohol, soluble in 44 of boiling alcohol, 60 of ether, and slowly in 2 of benzin. It consists chiefly of Stearin, but also has Palmitin and Olein, and is a constituent of Unguentum Hydrargyri. It is a harder fat than lard and more liable to turn rancid. It is used in ointments and liniments to give them greater consistency, but may be applied alone as a dressing to ulcers. In physiological action and therapeutics it follows the other oils and fats. [See under MORRHUÆ OLEUM and OLIVÆ OLEUM.]

ADONIS (Unofficial),—is the plant *Adonis vernalis*, the Pheasant's Eye or False Hellebore, a perennial herb of the nat. ord. Ranunculaceæ, which grows wild in Europe and Asia. It contains *Aconitic Acid*, also the toxic glucoside *Adonidin*, which is the active principle and is found in small quantity in all parts of the plant.

Preparations.

Tinctura Adonis, Tincture of Adonis (Unofficial),—Dose, ʒss–ij.

Infusio Adonis, Infusion of Adonis (Unofficial),—has from 4 to 8 parts of the plant in 200 of water. Dose, ʒss every 4 to 6 hours.

Adonidinum, Adonidin (Unofficial),—a canary-yellow, hygroscopic powder, of intensely bitter taste and neutral reaction, soluble in water and in alcohol. Dose, gr. ʒ, every 3 or 4 hours (Durand).

PHYSIOLOGICAL ACTION AND THERAPEUTICS.

Adonis, when fresh, has acrid, irritant and vesicant properties, which disappear when the plant is dried. It affects the heart in the same manner as Digitalis, but more promptly, slowing, regulating and strengthening the beats and raising the blood-pressure in the arteries. In consequence of the latter action it is a diuretic and removes edema and dropsy. It also slows and deepens the respiration, and relieves dyspnea. In toxic dose it paralyzes the terminals of the vagus, excites the accelerator apparatus of the heart, and finally causes paralysis of the cardiac motor nerves. It is rapidly eliminated and does not accumulate in the system. Adonidin has similar action, which is almost exactly like that of digitalin, but stronger, and about ten times as powerful as that of digitoxin (Brunton). In large doses it causes either vomiting or diarrhea (Huchard).

In Russia this plant is a household remedy for cardiac and renal dropsy, and in Siberia it is used as an abortifacient. It is useful in cases of uncompensated heart disease, in which, by reason of arrhythmia and feeble cardiac energy, grave circulatory disorders exist, especially dyspnea and dropsy. It is recommended in functional irregularity of the heart and in palpitation without any cardiac lesion (Da Costa). It acts more promptly than digitalis and may be administered for months without cumulative effect (Durand), hence it is preferred to digitalis in those cases of mitral or aortic regurgitation in which the latter drug is not well tolerated. In general it is less certainly beneficial in valvular disease than digitalis, and should only be used when the latter fails

(Nothnagel). In connection with the bromides this drug has been successfully used in epilepsy.

ÆTHER, Ether, Ethyl Oxide ($C_2H_5)_2O$,—in its absolute form is not official, the strongest preparation containing 4 per cent. of alcohol and some water. Considered as a generic term an ether is analogous to a salt as an alcohol is to a metallic hydroxide. The particular ether officially so named is *Ethyl Oxide*, prepared from ethylic alcohol (ethyl hydroxide), by a dehydrating agent with the aid of heat, and then purified by various processes. The agent used is sulphuric acid, hence this ether is improperly called sulphuric ether, but the acid simply dehydrates the alcohol and remains in the retort, becoming constantly more diluted by the abstraction of water from the alcohol. Consequently H_2O is the difference between Alcohol and Ether. $(C_2H_6O)_2 - H_2O = (C_2H_5)_2O$. The official ethers are the two first named in the following list.

Æther, Ether,—is a volatile and inflammable liquid, composed of about 96 per cent. of absolute ether (ethyl oxide), and about 4 per cent. of alcohol containing a little water. Its sp. gr. is 0.725 to 0.728 at 59° F. It is the preparation employed for anesthetic use, and is generally called *Sulphuric Ether*, a term which properly belongs to ethyl sulphate, $C_4H_{10}SO_4$. The dose of Ether for internal administration is $\mathfrak{m}x$ –xxx [av. $\mathfrak{m}xv$.] in syrup; hypodermically for heart failure, $\mathfrak{m}x$ –xx. The best preparation for use in prescriptions is the spirit, which mixes readily with water.

Water dissolves a tenth of its volume of Ether, and reciprocally Ether takes up about the same proportion of water. It is colorless, of a strong and characteristic odor, hot and pungent in taste. It evaporates speedily in the open air, with the production of considerable cold. When good, it evaporates from the hand, without leaving a disagreeable odor. It boils at about the temperature of the body, and its vapor is very heavy and very inflammable. It dissolves Hydrargyrum Bichloride, Hydrargyrum Iodidum Rubrum, Iodine and Bromine freely; Sulphur and Phosphorus sparingly. It is also a solvent of the fixed and volatile oils, many resins and balsams, caoutchouc, and most of the organic vegetable alkaloids. It does not dissolve Potash or Soda, in which respect it differs from Alcohol.

Æther Aceticus, Acetic Ether (Ethyl Acetate), $C_2H_5C_2H_3O$,—is an inflammable liquid, transparent and colorless, of ethereal and acetous odor, soluble in alcohol, ether, chloroform, and in 8 of water. It is composed of about 90 per cent. by weight of Ethyl Acetate, and about 10 per cent. of alcohol containing a little water. Dose, $\mathfrak{m}x$ –xxx, [av. $\mathfrak{m}xv$.]

Æther Nitrosus, Nitrous Ether, (Ethyl Nitrite), $C_2H_5NO_2$,—is official in the form of the Spirit (see next page).

Hydrobromic Ether, Ethyl Bromide, C_2H_5Br (Unofficial),—is not inflammable. Dose, internally and hypodermically, $\mathfrak{m}x$ –ʒss.

Hydriodic Ether, Ethyl Iodide, C_2H_5I (Unofficial),—is a colorless liquid, non-inflammable, and insoluble in water. Dose, inhaled, $\mathfrak{m}xv$.

For the Chlorinated Ethers see under CHLOROFORM.

Preparations.

Oleum Æthereum, Ethereal Oil,—is a volatile liquid, consisting of equal volumes of heavy Oil of Wine and Ether. Used to prepare the Spt. Ætheris Comp. As it occurs in commerce it is usually a worthless preparation.

Spiritus Ætheris, *Spirit of Ether*,—has of Ether one-third, Alcohol two-thirds. Dose, ℥x-ʒij, [av. ʒj.]

Spiritus Ætheris Compositus, *Compound Spirit of Ether (Hoffmann's Anodyne)*,—has of Ether 32½ per cent., Alcohol 65, Ethereal Oil 2½. Dose, ℥v-ʒij, [av. ʒj.]

Spiritus Ætheris Nitrosi, *Spirit of Nitrous Ether, Sweet Spirit of Nitre*,—is an alcoholic solution of Ethyl Nitrite, $C_2H_5NO_2$, containing not less than 4 per cent. of the latter. It turns acid with age, and should not be kept long. It is a constituent of Mist. Glycyrrhizæ Co. (3 per cent.). Dose, ℥x-ʒij, [av. ℥xxx.]

Incompatibles.

Incompatible with *Ether* are: Bromine, Chromic Trioxide; with *Acetic Ether* Alkalies, Chlorine Water, Chromic Trioxide, Water; with *Ethyl Bromide* Alkalies, Water of Ammonia; with the *Spirit of Nitrous Ether* Acacia, Acetanilide, Alkalies, Antipyrine, Carbonates, Ferrous Sulphate, Gelatin, Guaiac tincture. Iodides, Morphine, Tannic and Gallic Acids, Piperazin, Thymol, Uva Ursi preparations.

Analogues.

Chloroformum, *Chloroform*, and the Chlorinated Ethers, are described under the title CHLOROFORMUM.

Pental, *Tri-methyl-ethylene*, C_5H_{10} (Unofficial),—is a colorless liquid, highly inflammable, insoluble in water, but miscible in all proportions with alcohol, ether and chloroform. Sp. gr. 0.678. It is obtained by heating amylene hydrate in the presence of acids.

Pental is an efficient anesthetic, equal to Nitrous Oxide in its rapidity of action and safety, but superior thereto in its more prolonged action and having no unpleasant after-effects. Under it there is seldom any stage of exhilaration, and consciousness is sufficiently retained to enable response to commands, even when insensibility to pain is reached. It does not lose its effect by repeated inhalations. Compared with Chloroform, it acts more promptly, and has no evil after-effects; with Ethyl Bromide, it is somewhat slower in action but more lasting in effect, and can be prolonged as may be necessary; with Nitrous Oxide, it can be continued for a longer time, is more safe, and free from after-effects of unpleasant character.

Anesthetic Mixtures.

Nussbaum's has—Ether 3 parts, Chloroform 1, Alcohol 1.

Vienna General Hospital uses—Ether 9, Chloroform 30, Alcohol 9.

The Vienna Mixture,—Ether 3, Chloroform 1.

A. C. E. Mixture,—recommended by the Medico-chirurgical Society of London in 1864, consists of Alcohol 1, Chloroform 2, and Ether 3 parts.

M. S. Mixture,—has of Ether 56½, Chloroform 43¼ parts by volume, and is said to be a true molecular solution, containing neither of its ingredients free.

Meyer's Mixture, Anesthol,—has of the M. S. mixture (above) 83, Ethyl Chloride 17 parts by volume, and boils at 104° F. Dr. Meyer considers it a great improvement on the Schleich solutions, causing but slight general disturbance, no struggling, infrequent vomiting, rapid recovery, and no disturbance of the lungs or kidneys.

Schleich's Solutions—are three in number, and are made up by volume and not by weight, as follows: (No. 1), Ether 6, Chloroform 1½, Benzin (Petroleum Ether) ½. (No. 2), Ether 5, Chloroform 1½, Benzin ½. (No. 3), Ether 2½, Chloroform 1, Benzin ½; or Ether 80 Cc., Chloroform 30 Cc., Benzin 15 Cc. The latter is adapted to major operations and has a boiling point of 107.4° F.

PHYSIOLOGICAL ACTION OF ÆTHER.

Æther is anodyne, antispasmodic, diaphoretic and anthelmintic; a cardiac and cerebral stimulant, an anesthetic, and a narcotic poison. Given internally, it is a most powerful stimulant of secretion, acting especially on the secretions of the stomach, salivary glands and pancreas. On the cerebrum and the motor and sensory nerves its action is similar to that of alcohol, but more prompt and less protracted. It is eliminated rapidly, chiefly by the lungs. Externally it is a powerful refrigerant and local anesthetic; also rubefacient when rubbed into the skin.

Æther when inhaled produces at first faucial irritation, a sense of stran-

gulation and cough; then a stage of excitement (cerebral intoxication), in which the face is flushed and the respiration and pulse are accelerated. A tetanic convulsive stage generally follows, the face being cyanosed, the muscles rigid, and the respiration stertorous. This soon subsides, and complete insensibility is established, the muscles being then relaxed, the reflexes abolished, and the cerebral functions suspended, the lower centres in the medulla carrying on the processes of respiration and circulation. If the inhalation be continued, these also become paralyzed, death usually resulting from slow paralysis of respiration, the heart pulsating long after breathing has ceased. If the inhalation be discontinued before the lower centres are affected, the patient gradually emerges from the condition of insensibility, and, as the narcosis subsides, vomiting is usually experienced.

Dr. Brunton found that in a hot climate Æther will decompose within a few hours, and hence, during his investigations for the Hyderabad Chloroform Committee, he found it impossible to obtain pure ether. This may account for the preference for Chloroform as an anesthetic which is so universal in the Southern States.

Æther is less irritant than Chloroform to the mucous membranes when swallowed, but its vapor is more irritant to the air-passages. The one grave danger following its administration is the subsequent development of a bronchopneumonia, more rarely a lobar pneumonia. Acute mania has followed its inhalation for anesthesia, but only in a few cases. Æther is a cardiac and vaso-motor stimulant and raises the blood-pressure; Chloroform is a cardiac and vaso-motor depressant and lowers the blood-pressure. Æther has been often administered with safety in cases of organic heart disease. It does not clot the blood. Its vapor is very inflammable, less pleasant to inhale than that of Chloroform, is slower in action, has a longer stage of excitement, and a less profound narcosis, and causes a greater degree of vomiting. It is much less dangerous than Chloroform, death from the inhalation of Æther occurring slowly and usually by paralysis of respiration—from Chloroform, it is almost always sudden, and is generally believed to occur by paralysis of the heart. Æther has undoubtedly been the direct cause of a number of deaths, besides several which occurred some hours after the termination of its anesthesia; but the sudden deaths produced by it have nearly all occurred in patients who had some lung disease or some enervating lesion, as intestinal obstruction, tumor of the brain, cancer or kidney disease. When bronchitis or renal disease exists Æther is positively dangerous. The mortality of ether-anesthesia is about 1 in 10,000 cases.

Modes of Dying in Anesthesia.

(1.) From sudden paralysis of the cardiac ganglia, early in the inhalation, by reflex action proceeding from some peripheral injury before complete anesthesia is produced. Thus, in the extraction of teeth, a small quantity of Chloroform having been administered, the heart is enfeebled, and the action of the cerebral hemispheres suspended, but not that of the basal or medullary ganglia. If at this stage the 5th nerve be irritated, by the intimate relation of its nucleus with that of the pneumogastric reflex inhibition may be transmitted over the latter, arresting the cardiac ganglia. The stage of incomplete anesthesia is always a dangerous one in which to perform any operation around the distribution of the 5th nerve.

(2.) In the stage of rigidity, from tetanic fixation of the respiratory muscles, the blood backing up on the venous side, and arresting the heart's action, respiration ceasing before the cardiac action is stopped.

(3.) In the stage of complete relaxation, by paralysis of respiration; or by paralysis of the tongue, causing obstructed respiration.

(4.) In the same stage, by paralysis of the motor ganglia of the heart.

(5.) From depression of the functions by chloroform narcosis, and from shock,—and may occur in the anesthetic state, or afterwards.

Contraindications for Anesthesia are: fatty degeneration or dilatation of the heart, renal and pulmonary disease, fainting fits, enlarged tonsils, cerebral tumor, diabetes mellitus and chronic alcoholism—particularly the first and last named.

Dangerous Symptoms should be met by withdrawing the vapor and inverting the patient head downward, drawing the tongue forward and applying a cold douche to the face and chest. *Atropine* hypodermically is an agent of great value in combating the cardiac failure. *Artificial Respiration* and faradization of the respiratory muscles if breathing ceases. *Strychnine*, hypodermically, as a cardiac and respiratory stimulant, has many advocates, and has done good service, especially in chloroform narcosis. *Amyl Nitrite* by inhalation, or *Ammonia*, hypodermically. *Heat* to the body and limbs.

PHYSIOLOGICAL ACTION OF OTHER ETHERS.

Hydriodic Ether is an antispasmodic and a general stimulant; also an anesthetic if inhaled for a sufficiently long time. Its use as a medicinal agent is chiefly to bring the system rapidly under the influence of Iodine. It increases appetite, stimulates the action of the heart, gives vivacity to the general feelings and activity to the intellect.

Ethyl Bromide has a pleasant odor, produces but little irritation of the air-passages, has very brief stages of excitement and rigidity, and but a short stage of insensibility, with prompt awakening and little of the mental confusion and excitement consequent on the use of the other anesthetics. It is not inflammable, acts quickly, and is a good local anesthetic. Its action in other respects corresponds with that of Ether.

Nitrous Ether is a mild diaphoretic, a diffusible stimulant, a carminative, and an efficient diuretic. On the blood it acts similarly to Amyl Nitrite, diminishing oxygenation, relaxing the peripheral vessels, accelerating the heart's action, and lowering arterial tension. Relaxing the renal and cutaneous vessels, it is diuretic and diaphoretic.

Acetic Ether has a pleasant odor and taste, forming agreeable combinations with other carminatives as a stimulant and antispasmodic.

Comparative Safety of Anesthetics.

A comparison of these agents in respect to their safety has been made by Dr. Richardson, who considers *Methyl Ether* to be the safest of all, and the others as follows:
Safe are—Ethyl Bromide, Ethyl Chloride, Ether, Ethene (olefiant gas), Ethene Chloride, Methyl Bromide, Methyl Chloride, Methene Chloride, Methane (marsh gas), Nitrous Oxide.
Of doubtful value are—Amylene, Amyl Chloride, Butyl Chloride, Benzene (benzol).

Carbon Disulphide, Carbon Dioxide, Carbon Tetrachloride, Methyl Alcohol, Methylal, Spirit of Turpentine.

Dangerous are—Amyl Hydride, Butyl Hydride, Carbon Monoxide, Ethyl Hydride. Chloroform and Ethene Dichloride are considered useful, but requiring care.

THERAPEUTICS.

When diluted with alcohol Ether mixes readily with water, and may be administered internally with advantage in indigestion of fats, and to aid the digestion of cod-liver oil. It is given in hysteria to relieve the paroxysm and flatulence, and in hepatic colic from calculi, Ether with Turpentine (Durande's solvent remedy), which acts only as an anodyne and antispasmodic, is considered valuable by some authorities. Subcutaneously Ether is used in the algid stage of cholera, sudden cardiac depression, neuralgia, and in the adynamia of hemorrhage, pneumonia and the eruptive fevers. Local anesthesia by the Ether spray affords great relief in neuralgia of superficial nerves, lumbago, chorea, and spinal irritation. In minor surgical operations this is a valuable method.

As a *General Anesthetic* the vapor of Ether is less prompt in action than that of Chloroform, but is equally efficient and much safer. It should be inhaled in as concentrated a form as possible, and will then produce insensibility in from 5 to 10 minutes. It is the safest and most reliable anesthetic for major operations requiring complete relaxation and the expenditure of considerable time, and being the least depressant of all anesthetics should be preferred when shock is liable to be a prominent feature of the case. If a light be in the room it should be high above the patient, a grate-fire or gas-stove in the vicinity is very dangerous. [Compare the article on Chloroform.] Besides its surgical uses ether-anesthesia is employed in neuralgia, cancer, tetanus, chorea, colic, delirium, puerperal mania and convulsions, infantile convulsions, hystero-epilepsy, epileptic seizures, laryngismus stridulus, whooping-cough and asthma. The unpleasant after-effects may be greatly modified if not entirely prevented by the previous administration of Morphine, gr. $\frac{1}{8}$ – $\frac{1}{4}$, and Atropine, gr. $\frac{1}{120}$, subcutaneously. It is contraindicated in cases of asthma, chronic bronchitis, advanced pulmonary tuberculosis, and marked arterio-sclerosis.

Schleich's Method is based upon the theory that the safest general anesthetic is one which has a maximum evaporation point slightly above the body-temperature of the patient, so that its elimination by the lungs during each act of expiration may be nearly, but not quite, as much as its absorption during the previous act of inspiration. Such an anesthetic is obtained by mixing Ether, Chloroform and Benzin in various proportions, the result giving true chemical solutions (mixtures according to some chemists), the evaporation points of which may be varied at the will of the anesthetist and adapted to the patient's body-temperature at the time of administration. Experience has however disproved the claims made for these solutions, cases of deep cyanosis, excessive vomiting, broncho-pneumonia, albuminuria, and alarming conditions of the respiration and circulation having frequently occurred under their use.

Hewitt's Method, which is preferred in England, is to administer nitrous oxide gas first and follow with ether in a closed inhaler. This method is rapid and safe, the preliminary choking sensation of ether is avoided, and unconsciousness is quickly produced.

Ethyl Bromide had a short period of popularity as an anesthetic, but fell into disrepute after a few cases of death under its influence, which were probably not due to the agent used (Levis' and Sims' cases). Its action is less pro-

longed than that of Ether, but it has many advantages, being non-inflammable, acting rapidly in small quantity, and being comparatively free from ill effects. It may be used as a primary inhalation before the use of ether, a method of inducing anesthesia which has given good results in many cases, being free from bronchial irritation, requiring less ether to maintain the effect than when ether is given alone, having less intoxication and muscular excitement, less tendency to vomiting, and a more rapid return to consciousness. It is considered an excellent anesthetic in obstetrics and gynecology, its inhalation has proved useful in hysteria, epilepsy, chorea and other spasmodic disorders; and it has been employed subcutaneously in place of Ether in the treatment of spasmodic affections such as whooping-cough and chorea.

The Compound Spirit of Ether is an admirable agent in gastralgia, colic, flatulence, and syncope, also in the various paroxysms of hysteria. In combination with the camphorated tincture of opium it is often remarkably efficient in checking the simple diarrhea of hot weather.

Spirit of Nitrous Ether is used as a diaphoretic, a diuretic and a carminative; also in expectorant mixtures, as an antipyretic in febrile affections, and to relieve pain in angina pectoris, dysmenorrhea and asthma. When its diuretic effect is desired it should be administered in iced water, and the patient should be lightly covered: but when its diaphoretic action is required, it should be preceded by a hot drink, and the patient should be well covered.

Hydriodic Ether may be obtained in glass capsules containing five minims each, and is used by inhalation in chronic pulmonary disorders, cardiac dyspnea, spasmodic affections of the bronchi and larynx, asthma, and catarrhal laryngitis. It is not employed as an anesthetic.

AGARICUS ALBUS, White or Purging Agaric (Unofficial),—is the fungus *Polyporus officinalis*, which grows upon the European larch. It occurs in large, white, spongy pieces; and contains *Agaricic* or *Laricic Acid*, also from 40 to 70 per cent. of resins. The term *Agaricin* was formerly applied to the impure Agaricic Acid containing about 3 per cent. of *Agaricol*, which is physiologically inert.

The taste of Purging Agaric is first sweetish, then becoming very acrid and bitter. The powder inhaled causes violent sneezing, and taken internally in full doses it produces watery stools. Small doses check diarrhea and dysentery, and diminish the secretions of the bronchi and mamme.

Agaricus Albus was formerly employed as a drastic purgative, in doses of gr. xxx to ʒj. It has been used with much success, in 15-grain doses of the powder, or 3 grains of the alcoholic extract, to check the night-sweats of phthisis. *Agaricic Acid* has proved very valuable in checking persistent sweating from any cause, especially that occurring after influenza. The dose is gr. ʒj to ʒj; it should not be given hypodermically.

AGARICUS CHIRURGORUM, Surgeons' Agaric (Unofficial),—is the interior portion of the fungus *Polyporus fomentarius*, which grows on the trunks of beeches, birches, and oaks in Europe. It is prepared for use by boiling in weak lye and beating with mallets, and then occurs in light, thin, yellowish-brown pieces, soft and pliable, without odor or taste. It is almost pure cellulose. It was formerly used as a mechanical hemostatic, and for the purpose of moxa. When soaked in a strong solution of the Nitrate or Chlorate of Potassium and dried, it is very inflammable, and is called *Spunk*.

AGARICUS MUSCARIUS, Amanita Muscaria, Fly-Agaric (Unofficial),—is a poisonous mushroom, of disagreeable odor and burning acrid taste, used

in infusion with milk for poisoning flies, and by the Tartars as an intoxicant. It contains an actively toxic alkaloid, *Muscarine*, $C_5H_{13}NO_2$, of syrupy consistence, odorless and tasteless, soluble in water and alcohol, and readily dissolved out by water and dilute acetic acid, so that a doubtful mushroom may be easily rendered innocuous. *Muscarine* is produced synthetically by the oxidation of choline, but it is doubtful whether the article so prepared is as active as the natural alkaloid.

Muscarinæ Nitras, Muscarine Nitrate (Unofficial),—a viscid, yellowish-brown liquid. Dose, gr. $\frac{1}{30}$ – $\frac{1}{15}$ (Merck); gr. $\frac{1}{4}$ – $\frac{3}{4}$ (Ringer). It may be used hypodermically.

Incompatible physiologically with *Muscarine* are *Atropine*, *Digitalis*, *Physostigmine*. *Atropine* exactly opposes it, and *vice versa*; no example of physiological antagonism being so complete in all particulars.

PHYSIOLOGICAL ACTION AND THERAPEUTICS.

Agaricus acts as an intoxicant to the cerebrum, producing more vertigo and delirium than Alcohol, followed by profound sopor with lowered reflexes, perhaps coma and death. The action of *Muscarine* is very like that of *Pilocarpine* and almost completely opposed to that of *Atropine*. It is a powerful respiratory and cardiac depressant, paralyzing the respiratory centre and arresting the heart in diastole by depressing the motor ganglia while stimulating its inhibitory apparatus. It lowers the arterial tension, produces profound salivation, lachrymation and sweating, contracts the pulmonary vessels, causing intense dyspnea, and increases the intestinal, hepatic and pancreatic secretions, but markedly diminishes the renal. It disturbs the gastro-intestinal tract, causing tetanic intestinal contractions, severe colic, vomiting and purging. It produces spasm of the accommodation and contraction of the pupil when given internally, but dilates the pupil widely when locally applied. [Gelsemium does so also.] Under its action the body-temperature is decidedly reduced, and the excretion of waste-products is lessened. It is eliminated unchanged by the kidneys.

Muscarine has been as yet little used in medicine, but it will probably prove to be a valuable drug. It has been employed, with marked benefit, for the night-sweats of phthisis, given in doses of 5 minims of a one per cent. solution, hypodermically. It is of value in inflammation characterized by copious exudation, especially eye-inflammations, catarrhal jaundice, recent hemorrhoids, acute bronchitis, pulmonary hemorrhage, incipient pulmonary congestion, diabetes of both forms, and in constipation due to intestinal torpor and deficient secretion, accompanied by a torpid liver and difficult digestion of fats. In the latter affection it should be given in small doses, gr. $\frac{1}{30}$, thrice daily. A tincture of *Agaricus* has been found beneficial in ataxic typhus, chorea and chilblain.

AILANTHUS, Tree of Heaven (Unofficial),—is the bark of *Ailanthus glandulosa*, a well-known shade tree, of the nat. ord. Simarubaceæ, indigenous to China, but cultivated elsewhere. It contains an oleo-resin and a volatile oil, on which its properties probably depend. Dose, gr. x–ʒj.

Fluidextractum Ailanthus, Fluidextract of Ailanthus (Unofficial),—Dose, ʒx–ʒj.