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Resorcin. (Not official.)

HISTORY.—Resorcin is a chemical compound, discovered by Hlasiwetz and Barth, and was obtained from certain resins by the action of fusing alkalies. They assigned to the new compound the name *resorcin*, partly because it is derived from a *resin*, and partly because it has some similarity to *orcin*, a peculiar substance obtained from archil. Subsequently resorcin was constructed synthetically by Körner, and at the present time it is obtained in various ways, the product being both pure and cheap (Andeer).

PROPERTIES.—Resorcin is a member of the phenol group. It occurs in tabular prismatic crystals, rather shining and lustrous, somewhat sweetish to the taste, with a little after-pungency. When struck or rubbed in the dark, it appears phosphorescent. In odor it is somewhat like phenol, but not nearly so pronounced. It is freely soluble in water, in the proportion of 86.4 parts of resorcin to 100 parts of water at 0° C. It is dissolved by all liquids except chloroform and carbon sulphide. Aqueous solutions exposed to the air and light, assume a more or less brownish tint, but without any apparent change in quality. Albuminous liquids treated with a concentrated solution of resorcin, become turbid by the formation of an albuminate of resorcin. Various secondary products are obtained from it by the action of chlorine, iodine, bromine, nitric and nitrous acids, etc. In the process by which resorcin is produced, are also *hydroquinone* and *pyrocatechin*. The best vehicles, according to Andeer, are alcohol, glycerin, and sirup of orange. The dose for usual purposes ranges from five to fifteen grains. For a decided antipyretic effect a drachm may be given, but this amount could not be frequently repeated. Five grains may be given every two hours, in an ordinary case.

ANTAGONISTS.—From the physiological standpoint, resorcin is antagonized by the cerebral excitants, by the agents which raise the arterial tension, and by the cardiac and respiratory stimulants—by atropine especially.

SYNERGISTS.—Its effects are promoted by quinine, salicylic acid, carbolic acid, etc.

PHYSIOLOGICAL ACTIONS.—Resorcin does not irritate, nor is it absorbed by the unbroken integument. The solution injected into the subcutaneous tissues produces but little irritation, and never inflammation and abscess. Applied to the moistened mucous membrane, it causes vesication, and a white blister forms, like that from carbolic acid. It has decided anti-ferment properties, arrests decomposition in animal tissues, deodorizes, and is destructive of the minute organisms on the presence of which putrefactive decomposition is dependent. A one-per-cent solution will prevent the decomposition of urine when exposed to the air for months (Andeer). Applied to unhealthy wounds, it arrests the decomposition, destroys the fetor, and promotes healthy cicatrization (Dujardin-Beaumetz).

The action of lethal doses is necessarily to be studied on animals. Murrell has, it is true, given a good account of the symptoms produced by an overdose, but the details can be obtained only by experiments on animals. Soon after the administration of a full dose—thirty centigrammes (about five grains) of resorcin per kilogramme (about thirty-five ounces) weight of the animal experimented on—trembling begins, due to fibrillary contractions of the muscles, and this passes into general clonic convulsions of an epileptiform type. These convulsions regularly increase in severity, and, reaching their maximum in a few minutes, as regularly decline, the whole duration of this phase of the action being about two hours, sometimes longer. The spinal cord is doubtless the seat of the action, since the irritability of the peripheral nerves and muscles is diminished only, and not entirely destroyed. The general sensibility is preserved, whence it must be concluded that the action of resorcin is on the motor elements (Callias). The blood seems not to be altered in respect to its composition or properties; it presents a normal appearance, coagulates in the usual manner, and the venous blood, exposed to the air, assumes the proper red hue.

The lethal dose, according to weight, is ninety centigrammes per one kilogramme. The phenomena observed when such a dose is administered are the same as those above sketched, except that sensibility is impaired as well as motility.

Resorcin, through the action on the nervous system, affects the respiration and circulation when the dose is large. At first the respiration is greatly increased in frequency, becomes convulsive and jerking, and afterward shallow and weak but rapid. The action of the heart also becomes rapid, the pulse weak and somewhat irregular, but the respiration ceases before the action of the heart. The temperature rises, and just before death attains to 103° to 105° Fahr. This increase of the body-heat is doubtless correctly attributed to the extreme muscular action (Dujardin-Beaumetz), and not to irritation of a hypo-

thetical heat-center. Resorcin, which acts in many respects so like quinine, however, differs from this agent remarkably in respect to the lethal effects.

When a considerable dose of resorcin (thirty to sixty grains) is administered to a person in a fever, in a few minutes a sense of heat is felt about the epigastrium, and spreads thence over the system; the face flushes and grows hot, the eyes glisten, the breathing and pulse are accelerated, and dizziness, with ringing in the ears, and frontal headache, are experienced. A good deal of discomfort, oppression of the chest, and a sense of distention of the head, are usually produced, but these sensations subside in from ten to fifteen minutes, the skin then grows moist, and in a few minutes more a profuse perspiration is pouring out on the surface of the body. The pulse then falls, coolness succeeds to heat, languor to tension, and the temperature of the body declines several degrees. If the feverish state has no special features, the lessening of the pulse and reduction of temperature to the normal occurs in about an hour. The pulse may be slowed one third, and the reduction of temperature be as much as three or more degrees of Centigrade or five degrees Fahr. (Lichtheim). The reduction of temperature in fever is of comparatively brief duration, lasting from two to four hours. When the rise of temperature begins again, a sense of chilliness is experienced, which may even take the form of a distinct rigor. Lichtheim observed great differences in the power of resorcin in different fevers. The less the tendency to spontaneous remissions, the less the antipyretic effect. The fever accompanying pneumonia and erysipelas was less amenable to the action of resorcin than was typhoid fever, but no form of fever entirely resists its action. In the normal, the action on animals and on man corresponds closely. The correspondence also exists in respect to the action in pathological states, as above stated. To the information thus obtained may be added the experiences on healthy men, as furnished us by Andeer, by Baumann and Preusse, Fauber, and others. In small doses, the circulation, respiration, and temperature are but little affected. Andeer, from a dose of ten grammes (one hundred and fifty-five grains), suffered from dizziness, confused vision, deafness, considerable salivation; presently extreme vertigo and loss of consciousness occurred, and then general clonic convulsions and tetanic rigidity of the muscles of the neck came on. There was no decline of temperature. All of the effects subsided in five hours. The preliminary stage of excitement produced by resorcin is often accompanied with excitement and delirium. In one case a deep stupor; in others, muscular trembling and incoherence of speech were observed.

The elimination of resorcin takes place almost entirely by the urine, and it is effected quite rapidly, for the greater part absorbed is excreted in an hour. The state of the kidneys, therefore, must influ-

ence the rate of elimination, and correspondingly the duration of the physiological or therapeutical actions. The tests for ascertaining the presence of resorcin are not sensitive for small quantities. The most easily applied is the solution of perchloride of iron, which causes, when resorcin is present, a deep violet, almost black, color.

THERAPY.—A close correspondence exists in the therapeutical applications of the members of the phenol group, and Lichtheim traces a distinct parallelism between their anti-fermentative and antipyretic action. Resorcin, having much less irritating property, is generally preferable to carbolic acid for internal and for subcutaneous use. In *catarrh of the stomach, gastralgia, ulceration, and fermentative indigestion*, Andeer reports on a series of three hundred cases in which it acted most favorably. He prescribed chiefly a three-per-cent solution. In *fevers* it has been given with a view both to its antiseptic and antipyretic actions. It is not a specific, and is only serviceable in the ratio in which it reduces heat. In *erysipelas, puerperal fever, septicæmia, and diphtheria*, resorcin may exert an antiseptic effect. For the same reason it may be applied to the treatment of *ulcerative endocarditis*. In *intermittent fever* remarkable results have been lately obtained, which, if confirmed, will put resorcin in the front rank of remedies for malarial diseases. Indeed, it is highly probable that in one of the members of this group we will presently have a real rival and an equal to quinine.

Resorcin has been used by Dujardin-Beaumetz, Andeer, and others, with great success locally in *sypilitic* and other *sores* of an unhealthy or sloughing character. Its solution may be applied as spray in affections of the nose and throat, *catarrhal, ulcerating, or specific*. Andeer affirms that, applied in crystals or in powder, it is the most efficient remedy in *diphtheritic* affections, and he has employed it with equal success in *anthrax*.

Phenoresorcin.—By the term *phenoresorcin* is meant, by Riverdin, a mixture of carbolic acid and resorcin: sixty-seven parts of the former and thirty-three parts of the latter. This mixture crystallizes by cooling, and on the addition of ten per cent of water becomes a liquid which mixes with water in all proportions. Combining thus the virtues of both remedies, phenoresorcin offers many advantages, and may well repay more elaborate investigations.

Hydroquinone and Pyrocatechin; Kairine and Kairolin; Chinoline.—In the search for an artificial quinine, produced by a synthetical process, various substances, more or less closely related, have been formed. Of these, hydroquinone and pyrocatechine are very similar in all respects to resorcin. They correspond in physiological actions, and have the same power to depress febrile temperature. They are also closely allied to quinine chemically, and possess distinct antiperiodic power. When first produced, they were proposed as substitutes

for quinine; the close chemical relationship was supposed to imply an equally close physiological affinity. Further studies have shown that while these agents are very useful, they are inferior in all respects to quinine. Hydroquinone and pyrocatechine are very closely allied to resorcin; they may be substituted for this agent in corresponding doses, and they have the same range of applications.

Kairine and *kairoline* are new contributions to the phenol group. *Kairine* is a powder having a pale buff color, is slightly soluble in water, and has a bitter, somewhat aromatic, and, to most persons, a very disagreeable taste. If inclosed in a wafer, which is the most agreeable mode of administering it, a quantity of water should be taken after it, to prevent the caustic action on the mucous membrane.

Kairoline is, chemically, methyl-hydride of chinoline. It is very much less active than *kairine*, but the effects when produced are more lasting. The dose of *kairine*, as an antipyretic, is from fifteen to thirty grains, given in anticipation of the febrile rise, or it may be administered in smaller doses at intervals—for example, five grains every hour, until the desired impression is effected. *Kairoline*, being less active by half, must be given in corresponding quantity.

Chinoline.—So long ago as 1834 this substance was separated from coal-tar by Runge, and given the name *Leukoline*. Subsequently it was obtained by Gerhardt from the cinchona alkaloids, and by him the name *chinoline* or *quinoline* was assigned to it. Lately, chinoline has been produced synthetically by Skraup, by acting on aniline or nitrobenzol with glycerin in the presence of some dehydrating agent. Thus prepared, chinoline is an oily, highly refracting liquid and basic substance, which combines with acids to form salts. All of the salts, except the tartrate, are very deliquescent, crystallizing with difficulty, and soon losing their form; but the tartrate is in lustrous crystals, stable even in a damp atmosphere, and yet sufficiently soluble in water. According to Donath, chinoline is not more closely allied to quinine in physiological and therapeutical actions than it is chemically. Although these confident expectations, that in chinoline we have an adequate substitute for quinine, have not been realized, this remedy is still entitled to be regarded as a valuable antiseptic and antipyretic. Donath has shown that a two-per-cent solution will prevent the development of bacteria in decomposing solutions. Its power to reduce febrile heat is the same as that of the other agents of the group, except that it is greater. Indeed, chinoline is supposed to be nearly as active as quinine as an antipyretic. All of these phenol derivatives and congeners—resorcin, hydroquinone, pyrocatechin, chinoline, etc.—possess the power to reduce fever-heat, while they are powerless to affect the normal temperature. The fall of temperature is preceded by a short period of excitement—of increased rate of cardiac movement, warmth of the surface, flushing of the face, etc.; then perspiration begins, the

temperature declines, the pulse slows and becomes weaker, and the respirations lessen in number. The degree of antipyretic effect, and its duration, vary with the different members of the group. The behavior of the several agents is set forth with sufficient particularity above.

THERAPY.—These antiseptic and antipyretic remedies have been employed with considerable success in *fevers*, in *malarial* and *septic disorders*. Topically, they are used to arrest the multiplication of minute organisms, and to prevent the septic decompositions dependent thereon. Thus, chinoline has been applied locally in *diphtheria* by Seiffert with great advantage. He used a five-per-cent solution of the tartrate, which was freely painted over the affected surface; but, subsequently, he resorted to a five-per-cent solution of pure chinoline in equal parts of alcohol and water, as more effective and less disagreeable.

In *intermittent* and *remittent malarial fevers*, resorcin, but especially hydroquinone, *kairine*, and chinoline, have been used with marked success. A true substitute for quinine has not yet been produced, but these remedies, especially the last mentioned, have approximated closely. Further exact observations are necessary to fix the true position of these antipyretics and antiseptics.

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Acidum Boricum.—Boracic acid. *Acide boracique*, Fr.; *Bor-säure*, Ger.

PROPERTIES.—Boracic acid occurs in glittering, white, scaly crystals. It is soluble in twenty-six parts of cold and in three parts of warm water, and is freely soluble in alcohol.

ACTIONS AND USES.—Boracic acid possesses decided antiseptic and deodorant properties. It arrests fermentations and putrefactive de-

composition, and is destructive of minute organisms—bacteria, vibrio, etc. Applied to wounds, it is free from irritating effects; it lessens suppuration, and prevents decomposition.

Boracic acid occupies an important place in Lister's antiseptic method. It appears to be as effective as carbolic acid, and is even less irritating to the tissues than salicylic acid. A saturated solution may be employed as a dressing to fresh wounds to prevent the action of atmospheric germs, or to arrest decomposition in gangrenous, sloughing, or ill-conditioned wounds. "Boracic lint" is made by steeping lint in a saturated solution of boracic acid at the boiling-point; and, after drying, it is found to hold a large quantity of the acid, weighing nearly twice as much as before being thus treated.

Mr. Lister's directions for the application of boracic-acid dressings to ulcers are as follows: "The first step is to cleanse the sore and the surrounding skin once for all from septic impurity. This is done by treating the surface of the sore freely with a solution of the chloride of zinc (forty grains to the ounce); and at the same time washing the integument with a strong watery solution of carbolic acid, which is used on account of its remarkable power of penetrating the epidermis, while for the sore itself the solution of the chloride appears to be more efficient. This preliminary step having been taken, the boracic dressing is at once employed as follows: A piece of oiled-silk protective, of sufficient size to cover the sore and slightly overlap the surrounding skin, is dipped in the boracic lotion (a saturated, watery solution) and applied, and over this a piece of boracic lint large enough to extend for an inch or more beyond the protective on all sides, the whole being retained in position with a bandage."

Mr. Lister has used boracic solutions with great success in *pruritus ani*, *ulcers*, *skin-grafting*, *burns* and *scalds*, *eczema*, in operations on the *penis*, etc. By Mr. Watson, these solutions have been employed with excellent results in the dermatophyta; for example, *tinea tonsurans* and *t. circinata*—especially "in that very troublesome form of the disease which affects the scrotum and inner side of the thigh."

Boracic ointment may be made as follows: "Take of boracic acid finely levigated, one part; white wax, one part; paraffin, two parts; almond-oil, two parts. Melt the wax and paraffin by heating them with the oil, and stir the mixture briskly along with the boracic-acid powder in a warm mortar until the mixture thickens." When required for use, this ointment should be rubbed up with a little glycerin to the proper consistence, and then spread on muslin or linen.

Boracic acid may be employed in all the various forms and combinations in which carbolic and salicylic acids are now used by the antiseptic method.

Borocitrate of magnesia, originally proposed by Becker, has been recently strongly urged by Madsen as a solvent of urinary calculi of

the uric-acid variety. It may be extemporaneously prepared as follows: ℞ Magnesii carbonat., ʒ j; acid. citric., ʒ ij; sodii biborat., ʒ ij; aquæ bul., ʒ viij. M. Sig.: A tablespoonful three or four times a day.

Tartraborate of potassium is, probably, a more generally useful remedy for the purpose above indicated, as the potash compounds of uric acid are more soluble than the soda compounds. As a solvent of uric-acid calculi, this salt is preferable. It is obtained by heating together four parts of cream of tartar, one part of boracic acid, and ten parts of water. It is a white powder, or occurs in transparent scales, has an acidulous taste, and dissolves in two parts of cold water. A scruple may be given three or four times a day in water, and the more largely diluted it is, the better when used for the solution of calculi.

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Benzoinum.—Benzoin. A solid balsam obtained from *Styrax benzoin*. *Benjoin*, Fr.; *Benzocharz*, Ger.

COMPOSITION.—Benzoin is made up of resins. When subjected to dry distillation it yields *benzoic acid*, which is contained in it in the proportion of fourteen to eighteen per cent. Certain varieties of benzoin contain, also, *cinnamic acid*.

Tinctura Benzoini.—Tincture of benzoin, twenty parts; alcohol, sufficient to make one hundred parts. Dose, ʒ ss — ʒ j.

Adeps Benzoinatus.—Benzoinated lard. Benzoin, two parts; lard, one hundred parts.

Tinctura Benzoini Composita.—Compound tincture of benzoin. (Benzoin, socotrine aloes, storax, balsam of tolu, alcohol.) Dose, ʒ ss — ʒ ij.

Acidum Benzoicum.—Benzoic acid. Is in white, feathery crystals, of a peculiar, agreeable odor, and warm, acidulous taste, sparingly soluble in cold water, more soluble in boiling water, which deposits it in part on cooling, and very soluble in alcohol. Dose, gr. v — ʒ ss.

Ammonii Benzoas.—Benzoate of ammonia. Is in minute, white, shining, thin, four-sided, laminar crystals, with a slight odor of official benzoic acid, and a bitterish, saline, somewhat balsamic taste, and slightly acrid but persistent after-taste. It is soluble in five parts of water and in twenty-eight parts of alcohol. Dose, grs. v — ʒ ss.

Sodii Benzoas.—Benzoate of sodium. A white, semi-crystalline or amorphous powder, efflorescent on exposure to air, odorless, or having a faint odor of benzoin, of a sweetly astringent taste, and neutral

reaction. Soluble in 1.8 parts of water, and in forty-five parts of alcohol at 60 Fahr. Dose, gr. v — 3 j.

ACTIONS AND USES.—The physiological effects of benzoin and its preparations are due to benzoic acid. Taken in very considerable doses (3 ss), benzoic acid produces some epigastric heat, increases the pulse-rate, and promotes bronchial and cutaneous transpiration. The acidity of the urine is rendered more decided by it. A large part of the acid is excreted by the kidneys as benzoic acid, and a part undergoes conversion into hippuric acid.

Recent observations have shown that benzoic acid has decided antiseptic properties (Salkowsky). It manifests the same power to prevent fermentations and putrefaction, and to destroy minute organisms, as that possessed by salicylic and boracic acids.

The tinctures of benzoin were formerly used as expectorants in *chronic bronchial affections*. They are now sometimes resorted to for the local treatment (by atomization) of chronic laryngeal affections. Their most important use, however, is in the treatment of *foul-smelling wounds, flabby granulations, etc.* Unhealthy or sloughing wounds may be dressed with linen or cotton cloths saturated with the tinctures, with the effect to destroy fetor and stimulate to a more healthy growth. *Chapped hands and lips* and *fissured nipples* are best treated, according to Stillé, with a mixture of compound tincture of benzoin and glycerin. Benzoic acid may be used as a substitute for boracic and salicylic acids in the antiseptic treatment of wounds. Its solubility in water can be increased by the addition of borax.

Benzoate of ammonia is a remedy of great utility when the *urine is ammoniacal and loaded with phosphates*. Under its use the urine becomes acid, and the fermentative changes are arrested. In *chronic cystitis*, arising from any cause, this remedy should be prescribed when the urine undergoes the alkaline fermentation. *Incontinence of urine*, when due to an alkaline reaction of this excretion, is cured by the benzoate of ammonia. *Phosphatic calculi* may be dissolved by the long-continued use of this remedy.

Benzoate of sodium has lately occupied a large place in professional attention. Having similar antiseptic and antipyretic properties to those of salicylate of sodium, and being without any injurious effect, it came to be largely used in the septic maladies. The first important observations were those of Dr. Klebs, of Prague, who announced that this salt can be used with good effects in all infectious febrile diseases; that while the febrile movement does not cease as quickly as after the use of sulphate of quinine and salicylate of sodium, the results obtained from the benzoate are more permanent. Moreover, absolutely no unpleasant after-effects were observed from this remedy, even when its use was much prolonged, and as much as three hundred and eighty grains daily could be taken without inconvenience. The usual daily

quantity required in the treatment of diseases is ten to fifteen grammes, or one hundred and fifty to one hundred and eighty grains. Dr. Klebs advised the use of benzoate of soda in the acute infectious diseases, in tuberculosis, and catarrh of the bronchi. The principle underlying these suggestions of Dr. Klebs is the antiseptic. He holds that the maladies in question are of parasitic origin. The appropriate remedy is an antiseptic, destructive of germs. There are several remedies having these powers, but benzoate of sodium is best, because, while very destructive of minute organisms, it is free from injurious effects on the body. A remarkable and sudden extension was given to the use of this salt by the report from Innsbruck, that cases of consumption far advanced were being quickly cured in the clinic of Prof. Propop Rokitansky. Subsequent investigations proved the inaccuracy of such observations. Klebs held that he had proved the parasitic origin of phthisis, and Prof. Schüller, of Greifswald, confirmed his statements by additional experiments. It was discovered in Klebs's laboratory that, if animals were made to inhale the spray of benzoate of sodium, tubercular and diphtheritic matter did not affect them. Then followed the treatment of cases of *consumption*, by spray of a solution of the benzoate. Although the first claims put forth were greatly exaggerated—not entirely unfounded—there is reason to believe that the free use of benzoate spray is of service in some cases of consumption. According to the estimate of Rokitansky (Propop), the patient must inhale $\frac{1}{1000}$ of the body-weight daily of the benzoate in the form of spray, to do any good. Among the numerous observations in opposition to the views of Klebs and his followers, may be selected those of Guttman, who found that the treatment did not relieve a single symptom, and that there was no appearance in the affected lungs of any attempt at reparation.

Benzoate of sodium has been used in other infectious diseases. Thus Letzerich has employed it with success in the treatment of *diphtheria*. Of twenty-seven cases treated with this remedy in one epidemic, only one proved fatal, and this was an infant of feeble constitution. He gave from five to twenty grammes daily (seventy-five to three hundred grains), according to age, and applied the powdered benzoate by insufflation to the diseased parts. Other physicians have not been so largely successful, but many very favorable reports have been published (Kien, Hoffmann). Thus Demme found it highly serviceable in *diphtheria* and *scarlet fever*. It is well established that benzoate of sodium, added to the diphtheritic fungus, renders it harmless, so that the local use is founded on sound reasons. As an antipyretic in the *eruptive fevers*, in *typhoid*, and in *malarial fevers*, this salt may be preferred to the salicylate, than which it is safer, although much less effective as an antipyretic. In *acute rheumatism* it has been administered by Senator, McEwan, and others, who have found it a

good and safe remedy, but not so active as salicylic acid. Tordens has treated *whooping-cough* successfully, using the prescription of Letzerich: \mathcal{R} Sodii benzoat., \mathcal{D} iv; aquæ destil., aquæ menth. pip., $\mathcal{a}\mathcal{a}$ 3x; syrup. aurantii, 3ij. M. Sig.: Two drachms every hour or two.

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Antiseptic Oils.—*Oleum Caryophylli*. Oil of cloves.

COMPOSITION.—Oil of cloves consists of two substances—a hydrocarbon, *light oil of cloves*, and an oxygenated oil, *eugenol*, which has acid properties, and is therefore called *eugenic acid*. The light oil of cloves is isomeric with the oils of turpentine, copaiba, and cubeba.

Salicylic acid and a camphor known as *caryophyllin* are also constituents of the oil of cloves. Dose, gtt. ij—gtt. v.

Oleum Gaultheriæ.—Oil of gaultheria.

Spiritus Gaultheriæ.—(Oil of gaultheria, 3 parts; alcohol, 97 parts.) Dose, 3 ss—3 ij.

COMPOSITION.—Oil of gaultheria contains a hydrocarbon, *gaultherilen*, and an acid, *methysalicylic acid*, to which the acid reaction of the oil is due. Dose, gtt. v—gtt. xx.

Oil of gaultheria has been proposed and used successfully as a substitute for salicylic acid in the treatment of *rheumatism*, *gout*, and affections dependent on these diatheses respectively. It is best given in the form of an emulsion, and it may be combined with other agents having corresponding powers: thus— \mathcal{R} Olei gaultheriæ, 3j; acidi salicylici, \mathcal{D} iv; sodii biborat., 3j; syrup. picis. liquid., 3ij; aquæ anisi, 3ij. M. Sig.: Two teaspoonfuls every four hours.

Oleum Thymi.—Oil of thyme. The volatile oil obtained from *Thymus vulgaris*.

COMPOSITION.—Oil of thyme contains a hydrocarbon which, by fractional distillation, is resolvable into *cymene* and *thymene*. Its most important constituent is a solid crystalline substance, having acid properties and homologous with carbolic acid. This is known as *thymol*, or *thymic acid*. Dose, gr. ij—gr. x.

Oleum Cajuputi.—Oil of cajeput. The volatile oil obtained from the leaves of *Melaleuca cajuputi*. Dose, gr. v—gr. xx.

COMPOSITION.—The most important constituent of the oil of cajeput is *cajuputol*, or the bihydrate of *cajuputene*.

To this list might be added eucalyptol, the camphor obtained from *Eucalyptus globulus*, and the various balsams, and cymene and terpene volatile oils; but these remedies have already been considered elsewhere, so far as they possess any practical importance.

PHYSIOLOGICAL ACTIONS.—The composition of this group of oils indicates the close correspondence between them and carbolic, salicylic, and benzoic acids. So intimate are the chemical relations of salicylic acid, benzoic and cinnamic acids, that the balsams might with propriety be grouped with the antiseptics, for in their physiological actions and therapeutical applications they are equally as closely related as in their elementary composition.

Of the members of this group, thymol or thymic acid has been most elaborately studied. Lewin has shown that thymol, as respects its influence on fermentation and putrefaction, has a positive antiseptic property. Its actions are similar to those acids of the same class to which it is so closely allied chemically, viz., carbolic, salicylic, and benzoic. Locally applied, thymol, just as carbolic acid, produces paralysis of the end-organs of the sensory nerves (Lewin).

The effects of thymol have also been studied by Baltz. He has ascertained that from twenty to thirty grains a day are necessary to produce distinct effects. Placed in contact with the fauces, it causes an acrid sensation, which persists. It rarely excites vomiting, but a large dose induces a sensation of heat about the epigastrium, and sometimes diarrhœa. In the majority of cases thymol causes, in about half an hour to an hour, sweating more or less profuse, but distinctly less than that produced by salicylic acid and jaborandi. The urinary secretion is sometimes increased. The urine presents a dark, greenish hue, as if it contained blood. Singing in the ears, deafness, and a sensation of constriction of the forehead, are among the nervous phenomena. The researches of Lewin and Baltz place thymol in the same category with eucalyptol, salicin, salicylic acid, resorcin, and carbolic acid.

Myrtol.—This new antiseptic has the same relative origin as thymol; it is derived from the myrtle and is an oil, isomeric with the oil of turpentine (?). It is a very active antiseptic (Gubler). It prevents the decomposition of urine and other putrescible animal substances, and has been used to destroy the fetor of decomposing pus. As an active parasiticide it has been used successfully against the *round worm*, and the *ascarides* infesting the rectum. By Laboulbène it has been prescribed for the expulsion of *tænia*, with only partial success. The parasitic affections of the skin, *favus*, *herpes*, and *pityriasis*, are cured by myrtol.

In moderate doses this agent is rather grateful to the stomach, and

is a stomachic tonic or stimulant. The most important application made of it is in the treatment of *bronchorrhœg*, *fetid bronchitis*, *gangrene of the lung*, etc. Eliminated by the lungs largely, it stimulates the tissues through which it passes, and thus a local action is added to the systemic effect. *Chronic bronchitis*, *capillary bronchitis*, *whooping-cough*, *humid asthma*, etc., are maladies in which it may be expected to afford a large measure of relief. In *hæmaturia* not due to acute congestion, and in *passive hæmorrhages* in general, it has been used with success.

It has long been known that oil of cloves, and indeed the essential oils generally, have the power to relieve a painful state of a sensory nerve. Inserted into the cavity of an aching tooth, they suspend the pain. A solution of oil of cloves in rhigolene is a nostrum for the cure of superficial *neuralgia*. ℞ Ol. caryophylli, ol. gaultheriæ, ol. thymii, āā ʒj; tinct. benzoini, tinct. cinnamomi, āā ʒiv. M. Sig.: *Apply on lint, and cover with oiled silk.*

The oil of cloves is the most effective deodorizer for sponge-tents hitherto employed.

The essential oils dissolved in alcohol (essence or tincture) are much used to correct *flatulence*.

Cajeput-oil has been used successfully in *cholera*, *cholera-morbus*, and *nervous vomiting*. ℞ Ol. cajuputi, ʒj; spts. chloroformi, tinct. cinnamomi, āā ʒj. M. Sig.: *A teaspoonful every half-hour in glycerin or sirup and water.* As a parasiticide, cajeput-oil is an effective local application in parasitic skin-diseases—*scabies*, *tinea*, *pityriasis*, etc.—and in the form of enema, in a suitable vehicle, against *ascarides vermiculares*.

AGENTS USED TO MODIFY THE FUNCTIONS OF THE NERVOUS SYSTEM.

In this division, remedies are employed with a view to their influence over the functions of the nervous system. They do not, immediately or necessarily, affect the function of nutrition; they do not enter into the formation of tissues; and, having modified the functions of the nervous system, they are excreted from the organism in the form in which they entered it. It is probable that the selective action on this system is due to the fact that the nervous tissue is the most highly specialized in function, and therefore most susceptible to such impressions.

The different parts of the nervous system are so closely united in function that a disturbance at any point is differentiated to other and often widely-separated points, and the complexus of effects is made up of many minor disturbances. For this reason it is quite impos-

sible, in the present state of our knowledge, to make a classification which will sharply define the limits of activity of any particular remedy. Nevertheless, physiological experiment and clinical experience have furnished us sufficiently accurate information with regard to the most important actions of the remedies of this division, to justify an arrangement based on their most conspicuous qualities.

AGENTS WHOSE MOST IMPORTANT QUALITY CONSISTS IN EXCITING FUNCTIONAL ACTIVITY.

A.—OF THE SPINAL CORD AND SYMPATHETIC.

Electricity.—*Electricité*, Fr.; *Electricität*, Ger.

Forms of Electrical Force employed in Medical Practice.—Magnetism, static or frictional electricity (franklinism), galvanism, faradism (electro-magnetic, magneto-electric).

STATIC OR FRICTIONAL ELECTRICITY.

This is obtained by friction from glass, as in the cylinder or plate, and by induction from the Holtz electrical machine. The last-named instrument is best adapted for medical use. The prime conductor of the electrical machine furnishes positive or vitreous electricity, and the rubber, negative or resinous. Various modes of electrization by static electricity are resorted to:

1. By sparks. In this mode the part to be acted on is made to receive sparks from the machine in action.
2. The electric bath. The patient is placed on an insulated stool, and is charged with positive or negative electricity from the prime conductor, or rubber, according as he is in connection with either. Sparks may be drawn from the affected part by presenting the knuckles or a metallic conductor. A sharp, tingling sensation, followed by redness and wheals, is produced by sparks, whether received from the machine or drawn from the body.
3. By the Leyden-jar. In this method, the electricity is condensed in the Leyden-jar, and the charge is transmitted through the part to be acted on.

Owing chiefly to the physicians of Guy's Hospital, London, and Dr. Charcot and his pupils, Dr. Arthius and Dr. Vigouroux, of Paris, the use of static electricity as a therapeutical agent has been revived and rendered entirely practicable. Dr. Morton, of New York, and the author, simultaneously arrived at a method of using the Holtz electrical machine as a means of stimulating muscular contractions, and as a substitute for the faradic current in cases requiring such treatment. Before describing these manipulations it is necessary to say something regarding the structure of the Holtz machine. Various modifications of the original pattern have been introduced; but the most successful is