destroyed. The offensiveness of an *ozœna* may be removed by the same expedient. *Chronic nasal catarrh* may not unfrequently be greatly benefited by the vapor of bromine. Hammond has proposed the internal use of a solution of bromine, as a substitute for the bromides in the treatment of *epilepsy*. Besides its disagreeable qualities, and its irritant action, it has no advantages over the bromides.

The most important use of bromine is as an escharotic. For the destruction of *chancre*, it is probably the best caustic. *Hospital gangrene*, the experience of the rebellion demonstrated, was more certainly arrested by bromine than by any other escharotic.

For the destruction of *carcinoma uteri*, this agent is preferred by some eminent gynæcologists. When used for these purposes, pure bromine is applied, by means of a glass rod, thoroughly, to the diseased or sloughing or gangrenous surface.

The objections to the use of bromine are its fetid odor, its volatility (boils at 117° Fahr.), and the pain which attends its escharotic action.

Acidum Carbolicum.—Carbolic acid. *Phénique acide*, Fr.; *Carbolsäure*, Ger. A product of the distillation of coal-tar. Is either in acicular crystals or in crystalline masses; white or colorless when perfectly pure, but, even when slightly impure, either reddish or becoming so on exposure; deliquescent and readily assuming the liquid state in the presence of a little water, yet not dissolving; of a strong odor and taste, recalling those of creosote, but distinct; fusible at from 93° to 106°, forming an oily liquid. It is soluble in from twenty to thirty-three parts of water, the purest being most soluble. Alcohol, ether, chloroform, glycerin, and the essential oils, dissolve it freely. It combines with alkalies and other salifiable bases, but its compounds have still an alkaline reaction and are decomposed by the feeblest acids, even by carbonic acid. Dose, gr. $\frac{1}{4}$—gr. j.

Acidum Carbolicum Crudum.—Impure carbolic acid. Is either colorless or has a brown shade. It consists of carbolic and cresylic acids, in variable proportion, with impurities derived from coal-tar, which vary from ten to thirty per cent.

Glyceritum Acidi Carbolici.—Glycerite of carbolic acid (not official), (℥ ij carbolic acid; half a pint of glycerin).

Aqua Acidi Carbolici.—Carbolic-acid water (not official), (glycerite of carbolic acid, ʒ x; water, one pint). Dose, a teaspoonful to a half-ounce.

Unguentum Acidi Carbolici.—Ointment of carbolic acid. (Carbolic acid, 10 parts; ointment, 90 parts.) (U. S. P.)

Creosotum.—Creosote. A product of the distillation of wood-tar. A colorless, oily, neutral liquid, having a strong, characteristic odor,

and an acrid, burning taste. Is sparingly soluble in water, but mixes in all proportions with alcohol and ether.

It is distinguished from carbolic acid, which it in some respects closely resembles, by not coagulating collodion when mixed with it, and by not imparting a blue color to a slip of pine-wood dipped first into an alkaline solution of creosote, and then, after drying, into muriatic acid.

Aqua Creosoti.—Creosote-water (creosote, 1 part; distilled water, 99 parts). Dose, a teaspoonful to an ounce.

Carbolic acid has largely superseded creosote as a remedy.

Antagonists and Incompatibles.—Combination with alkalies diminishes, but does not entirely check, the physiological activity of carbolic acid. Saccharate of lime, or lime, is probably the most efficient antagonist from the chemical point of view (Th. Husemann). In cases of poisoning, this substance should be given freely. The mucous membrane should be protected as far as possible by the administration of vegetable demulcents, but not by oils and glycerin, which favor absorption. I am indebted to Dr. A. C. Post, of New York, in a verbal communication, for the important fact that atropine is a physiological antagonist to the systemic symptoms induced by carbolic acid. He was induced to administer atropine in a case of poisoning by carbolic acid, on observing the minutely contracted pupils and the failing circulation. The result was successful. Similar success has attended the same practice in other cases. Experiments on animals have also demonstrated the existence of this antagonism, which may now be regarded as an established fact. The rules for guidance in the administration of atropine are the same as in other cases: a sufficient quantity of the antagonist is administered to maintain dilatation of the pupil and to overcome the depression of the circulation and respiration. Elimination should also be promoted by the free use of diluents.

Synergists.—All of the phenols, the antiseptics, the motor depressants, etc., increase the effects of carbolic acid.

Physiological Actions.—Applied to the integument or to the mucous membrane, carbolic acid produces a burning sensation of short duration, and there is formed a whitish, superficial eschar, which subsequently becomes brownish. The taste of carbolic acid is sweetish, cooling, and then pungent and hot. When swallowed by accident or design, the mucous membrane appears as if brushed over with a strong solution of nitrate of silver, and becomes hard and dry like leather. This appearance is observable about the lips, fauces, the œsophagus, the cardiac and pyloric extremities of the stomach, and the summits of the folds of the mucous membrane in the organ generally. This change in the condition of the membrane is due to the power of carbolic acid to coagulate the albumen of the tissues. Vom-

iting is not constant, even when toxic doses are swallowed, and the vomited matters smell of the poison. From medicinal doses, a cooling, rather grateful sedative effect is experienced in the stomach. It diffuses into the blood with great facility, from the stomach, from the external integument, and from wounded surfaces. Cases of poisoning have resulted from application to a patch of psoriasis (Toel), to scabies (Hoppe-Seyler, Machin), to the uterine cavity, after the enucleation of a fibroid (Rheinstädter), to abscesses (Köhler, Wallace, White), to the rectum for the relief of ascarides (Pinkham, Michaelis), and to the integument and wounds, in cases of antiseptic surgery. Diffusion takes place with such rapidity, from these various sources, that formidable symptoms arise in a few minutes. The amount necessary to produce distinct effects varies; besides the difference due to age, there are variations in susceptibility. A one-per-cent solution has caused serious symptoms when injected into an abscess and into the rectum. Six drops of the pure acid have caused dangerous symptoms, and a teaspoonful has terminated fatally, but one case is reported in which this amount was recovered from when taken by a child two and a half years old (Dessau). A tablespoonful has caused death in several instances (Cowling, Packer, and others). In Hoppe-Seyler's cases, while the two apprentices were rubbing each other's backs, both were seized suddenly with giddiness, vertigo, and tension of the head, and quickly passed into unconsciousness. These effects are also experienced when the poison is taken into the stomach. The warnings of danger, which may be expected when the remedy is brought in contact with the tissues at any point, are, besides the local irritation, sudden vertigo, contracted pupils, pallor of the face, embarrassed respiration, and feeble circulation. When the dose is a fatal one, unconsciousness quickly supervenes, the breathing becomes stertorous, the surface grows cold, the action of the heart gets more and more feeble, and death finally occurs from failure of respiration. Convulsions occur in animals, but in man this symptom is wanting, or at most fibrillary trembling, and some trismus of the jaws, are present.

The changes in the blood induced by carbolic acid have been much disputed. That it enters the blood as carbolic acid seems positively established, although, having acid properties, it may become a carbolate. The acid has been discovered in the blood by Hoppe-Seyler. That it appropriates oxygen and thus undergoes some change in the blood is highly probable. Husemann maintains that the blood in carbolic-acid poisoning is very much altered in character, becoming dark in color and coagulating with difficulty, but in the reports of various *post-mortem* examinations it is remarked that the blood was coagulated in the heart and great venous trunks. Outside of the body the blood is quickly changed on the addition of carbolic acid, but these changes do not correspond to those which occur within the body. The action of

the heart is at first slowed, but toward the end it becomes rapid. The blood-pressure falls considerably below the normal, due, Hoppe-Seyler says, to vaso-motor paresis. The first slowing of the heart is caused by stimulation of the end-organs of the vagus, and is prevented by division of the trunk of the nerve. The subsequent rapid action is due to the removal of the inhibition from paralysis of the vagus. Respiration is at first stimulated and the respiratory acts are more frequent, but they are also more shallow. Division of the pneumogastrics does not entirely prevent this stimulation, although it lessens the effect, whence it is concluded that carbolic acid also stimulates the respiratory center in the medulla (Salkowsky). This conclusion is strengthened by the fact that, if the vagi are previously divided, the administration of carbolic acid will still increase the respiratory acts for a time, showing that the stimulation of respiration must be effected by an action on the end-organs of the vagi in the lungs as well (Salkowsky). Lowering of the temperature has been constantly observed in the experiments on animals, and in the cases of poisoning of man. The surface of the body is cool, and more or less livid. There are several factors concerned, doubtless, in the reduction of temperature. The diminution in the blood-pressure and the arrested oxidation are the chief. The power of carbolic acid to reduce the temperature of fever is also clear, but in this respect it is inferior to salicylic acid (Eisenstein). In cases of poisoning the reduction of temperature reaches several degrees, but in the normal condition in man ordinary medicinal doses have but little effect in this direction.

A more or less minutely contracted pupil is a nearly constant phenomenon in carbolic-acid poisoning. It can hardly be doubtful that this effect is due to paralysis of the radiating fibers, leaving the circular fibers unopposed. Carbolic acid unquestionably acts on the cerebral lobes—on the centers of conscious impressions—and suspends their functions. Vertigo and singing in the ears occur, and then consciousness is lost, the reflexes are suspended, and complete muscular resolution ensues. In warm-blooded animals clonic convulsions are produced, succeeded by paralysis. By direct application, as Bill was the first to demonstrate, carbolic acid suspends the irritability of the sensory nerves. If a tract of the integument be painted over with pure carbolic acid, an incision may be made into the part without the least pain being experienced. The peripheral nerves, sensory and motor, are not affected by the systemic action. The muscles after poisoning respond energetically to the usual forms of stimulation. It follows, then, that the action of the poison is centric and not peripheral (Salkowsky, Lemaire, Rothe).

The elimination of carbolic acid takes place by various channels of excretion, chiefly by the urine. It may be detected by the odor in the breath of poisoned animals (Lemaire). It has been found in the

saliva by Hoppe-Seyler, but Bill could not detect it in the perspiration or in the fæces. Hoffmann maintains that carbolic acid undergoes oxidation in the blood, but, as a part of it may be separated unchanged from the urine, this statement is not wholly true. That much of the carbolic acid taken is oxidized before being excreted is proved by the character of a secondary product which appears in the urine. One of the earliest indications of the toxic action of carbolic acid, especially when applied locally, is a dark-greenish, blackish, or smoky hue of the urine. Although this appearance does not actually prove that danger to life is imminent, it is a warning to be heeded. One of the results of the oxidation of carbolic acid is the formation of oxalic acid. The same process takes place in animals, in whom carbolic acid is excreted as oxalic. Doubt has been thrown on the methods by which carbolic acid is detected in the urine of those taking it, through the experiments of Städeler, who has discovered that carbolic acid is present in normal urine. Hoppe-Seyler, however, has proved that, by Städeler's process, carbolic acid is made from the indican of the urine (Hermann). The elimination of carbolic acid taking place through so many channels is readily effected, and probably the whole amount is thrown out in twenty-four hours. When death occurs very quickly in fatal cases of poisoning, the tissues and organs will smell distinctly of the poison (Ogston). Death has occurred in a few minutes—in a great majority of the fatal cases within two hours (Jeffreys), and is rarely postponed to two days. The amount of carbolic acid present will therefore vary.

There are no characteristic *post-mortem* appearances, except the changes wrought at the points of contact with the acid. The mucous membrane of the mouth, fauces, œsophagus, and stomach, where acted on, appears corrugated, tough, and discolored—whitish changing to brownish discoloration, surrounded by a zone of hyperæmia, or capillary hæmorrhages here and there sloughing off. Congestion of the viscera generally, especially of the brain and the meninges, is a constant phenomenon. The lungs are œdematous as well as congested. The heart may be distended with loose clots, and relaxed, or empty and contracted. By some observers changes akin to those of phosphorus-poisoning have been uniformly discovered (Neumann), i. e., acute fatty degeneration of liver, heart, kidneys, and other organs, notably the renal epithelium. Husemann, Salkowsky, and others, deny the reality of these observations, so that further examinations are necessary to determine this point.

Therapy.—*Nausea and vomiting* due to an irritable state of the stomach-nerves are relieved by carbolic acid. Combination with bismuth enhances the effect. ℞ Acidi carbolici, grs. iv; bismuthi subnitrat., ʒ ij; mucil. acaciæ, ℥ j; aquæ menth. pip., ℥ iij. M. Sig.: *A tablespoonful every two, three, or four hours.* Attacks of *cholera morbus* and *cholera infantum* are not unfrequently very promptly arrested

by the exhibition of carbolic acid, or the combination of carbolic acid and bismuth. *Eructations of gas*, due to the fermentation of foods, and the vomiting of yeast-like matters, especially when due to the presence of *sarcina*, are often arrested by this remedy. Good results have been obtained by the use of carbolic acid in *Asiatic cholera*. Combination with iodine is said to be more effective (Choleratropfen). ℞ Acidi carbolici, grs. iv; tinct. iodi, gtt. xvj; aquæ menth. pip., ʒ iv. M. Sig.: *A tablespoonful every hour, or oftener.* The same formula has been used successfully in *cholera nostras* and *cholera infantum* (Rothe).

Based on its power to arrest the action of ferments, carbolic acid has been used, with certainly temporary good results, in *diabetes* of hepatic origin (Ebstein, Habershon).

Inhalations of carbolic-acid spray possess a high degree of utility in *chronic nasal catarrh*, *hay-asthma*, *chronic bronchitis*, and *whooping-cough*. A solution in water, to the proportion of one per cent, is a suitable solution for this purpose. It may be combined with the tincture of iodine. The efficacy of these inhalations in hay-asthma and in whooping-cough is probably due to the fact that carbolic acid destroys the minute organisms (cacobacteria, pollen), on the presence of which the morbid action in these maladies depends (Letzerich). The vapor of carbolate of iodine may be inhaled in these diseases. The warmth of the hand suffices to vaporize a mixture of carbolic acid and tincture of iodine.

In *pulmonary phthisis*, when there is much teasing cough, or when expectoration is profuse and foul-smelling, these inhalations are serviceable. In *gangrene of the lung*, carbolic spray and the acid internally are used to destroy the fetor. A one-per-cent solution of carbolic acid and a mixture of carbolic acid and iodine have been injected with asserted advantage into *phthisical cavities* through the parietes of the thorax.

Internally, also, creosote and carbolic acid, especially the former, have been used with conspicuously good results in the treatment of the several forms of *consumption*, except *phthisis florida*. Probably the most useful observations to illustrate this point are those of MM. Bouchard and Gimbert. They used pure creosote from wood, and in the following formula: Pure creosote, 13·5 parts; tincture of gentian, 30 parts; alcohol, 250 parts, and sufficient Malaga wine to make up a thousand parts. Of this solution from two to five tablespoonfuls are taken daily. In other cases the creosote was given in cod-liver oil, which is an excellent vehicle—2 parts of pure creosote to 150 parts of cod-liver oil. The daily quantity varied from six to nine grains, and in rare cases from twelve to fifteen grains. Of ninety-three cases of phthisis treated with this remedy, twenty-five were apparently cured, twenty-nine were improved, eighteen remained no better, and twenty-

one died. Creosote thus had a good effect in fifty-four out of ninety-three cases. The evidences of improvement consisted in the diminution of the expectoration, cough, and fever, and increase in the appetite, strength, and weight of body. The diminution of the expectoration, and consequently of the cough, was the first evidence of improvement, although at the beginning of the treatment the cough is apt to be increased for a short time by creosote. If the cough and expectoration are constantly increased, the medicine must be stopped. The danger of hæmoptysis is rather lessened than increased by the creosote treatment. Schnitzler, of Vienna, has employed, recently, the subcutaneous injection of carbolic acid in more than one hundred cases of consumption. He practiced the injections daily, sometimes twice a day, administering each time from one eighth to one fourth of a grain. The result was, in most cases, the fever was reduced, the pulse became slower and stronger, and the night-sweats were diminished. He concludes that these injections are nearly if not quite as effective in relieving hectic as quinine.

Influenced by the germ theory of disease, carbolic acid has been much prescribed in the treatment of *typhoid fever*, *diphtheria*, *scarlet fever*, *erysipelas*, etc. Whether the theory be true or false, there can be no doubt of the good effects of creosote and of carbolic acid in these diseases. Pécholier, of Montpellier, has given creosote in sixty cases of typhoid, set apart for study of the results of the action. Good effects were obtained; the temperature kept down; the delirium and insomnia were much less; the intestinal disturbance declined, and thus the violence of the disease was distinctly lessened. M. Chapelle maintains that it cuts short an attack of typhoid. In the other maladies above named, the evidence of the good effects of carbolic acid is constantly accumulating. Besides the internal administration, local application to the fauces of spray, or suitable solutions, are useful in diphtheria and scarlet fever to remove fetor, and to destroy the germs of contagion which may be lodged there. Recently Rothe has treated a number of cases of typhoid fever, with great success, by a mixed antiseptic and antipyretic method, in which he employs carbolic acid and iodine administered in infusion of digitalis. The author has for several years treated the cases of typhoid and typho-malarial fever so called, which have been in his hands, with a drop each of tincture of iodine and liquefied carbolic acid every two or three hours, with results which were certainly most favorable. As Rothe has observed, this antiseptic treatment lowers the heat, lessens the diarrhœa, improves the mental state, and, indeed, diminishes the severity of the disease remarkably. The value of carbolic acid as a remedy in *malarial fevers* seems now conclusively established. The experiences of Eisenstein in the Vienna General Hospital are especially valuable. He obtained distinct curative effects in twenty-four cases of the *tertian*

and in four cases of the *quotidian* type of intermittents. The author has found the combination of carbolic acid and iodine of great value in *chronic malarial infection*, and in the more acute cases after quinine has stopped the paroxysms. As an antipyretic, Eisenstein justly regards carbolic acid as inferior to salicylic. It is probable that resorcin, hydroquinone, and other phenols, will prove more useful than either. Dr. Lecaille has found carbolic acid remarkably efficacious in *yellow fever*, and even after the occurrence of the ominous "coffee-grounds" vomit. He administers it both subcutaneously and by the stomach.

The dose of carbolic acid for internal use ranges from half a grain to two grains, or of the liquefied acid from half a minim to two minims. It may be given in mint-water, which covers the odor somewhat. This quantity may be repeated every hour or two, if necessary, without producing ill effects, if not too long continued. As mentioned above, the quantity given by Bouchard and Gimbert sometimes reached as high as fifteen grains a day. The mixture of bismuth, mucilage, and glycerin, is an excellent vehicle. When iodine and carbolic acid are given together, a colorless carbolate is formed when they are dropped into water.

Parenchymatous Injection of Carbolic Acid.—The deep-seated injection of carbolic acid has been proposed and successfully practiced for the relief of various morbid states. For this purpose a two- to five-per-cent solution is most suitable. A solution stronger than this may excite inflammation in the part and coagulate the blood. It is directed by Hüter that the needle of the hypodermatic syringe be first inserted into the inflamed part, and, if no blood flows out through the needle, it will be known that a vein has not been penetrated. From twenty to thirty minims of the solution are then injected. The injections are made once or twice a day in acute diseases, and on alternate days, or less frequently, in chronic cases. Very remarkable results have been obtained from these injections in *erysipelas* (Hüter, Aufrecht) and in *pleuro-pneumonia* (Kunze).

Dr. Tessier, of the Mauritius, reports that *intermittents* are rapidly cured by the injection of three quarters of a grain of carbolic acid dissolved in twenty minims of water.

The parenchymatous injection of carbolic acid is more especially adapted to the treatment of certain surgical maladies. Hüter has employed this method successfully in *lupus*, *chancroid*, *secondary syphilitic abscesses*, *ulcerations*, *synovitis* (injected into the affected joint), *fistulæ*, *enlarged bursæ*, *hydrocele*, etc. Levis, of Philadelphia, cures *hydrocele* by injecting liquid carbolic acid into the sac after drawing off the fluid. He first inserts the needle of the syringe so that it may be certain the point rests in the cavity. Then the fluid is drawn off, and finally the acid, a drachm or two, is injected through the needle.

Local Application of Carbolic Acid.—*Itching of the skin*, arising from any cause, is allayed by sponging the part with a solution of carbolic acid. ℞ Acid. carbol., ʒ ij ; glycerini, ℥ j ; aqua rosæ ad ℥ viij. M. Sig. : *Lotion.* This application is especially serviceable in *prurigo* and *prurigo sinalis.* Carbolic acid is an effective application in parasitic skin-diseases—*pityriasis versicolor, tinea tonsurans, tinea circinata, favus, scabies*, etc. ℞ Acid. carbol., ʒ j ; glycerini, ℥ j. M. Sig. : *Local application for parasitic skin-diseases.* The internal administration of carbolic acid should be conjoined with its local use in *prurigo, chronic eczema*, and *sycosis parasitica.*

The following is an efficient local application for *chilblains:* ℞ Acid. carbol., ʒ j ; tinct. iodi, ʒ ij ; acid. tannici, ʒ ij ; cerat. simplicis, ℥ iv. M. Sig. : *Ointment.*

Undiluted carbolic acid is used as a mild escharotic to the so-called *mucous patches*, to *condylomata, vegetations*, etc., *lupus, scirrhus, cauliflower-growths*, etc. The author has witnessed results which appear to him to justify the statement that carbolic acid, applied undiluted to the cancerous sore and injected underneath, limits the extension and retards the growth of the disease. In several cases, the disease having recurred at the site of the operation for its removal, the author has apparently arrested the morbid process by injecting beneath and into the new formation daily a syringeful of a five-per-cent solution of carbolic acid. The action in these instances seemed to be local : there were none of the evidences of systemic impression of the poison, and no diffusion of the cancer-germs took place from the point of infection. If further experience confirms these observations, we have in this method a most important contribution to our resources.

Undiluted carbolic acid is an efficient application to *ulcers of the cervix uteri, chronic endo-cervicitis*, and *endo-metritis.* It may be applied undiluted without risk to the mucous membrane of the uterine cavity, on the cotton-wrapped probe, after preliminary dilatation of the canal. There is, probably, no better means of treating uterine catarrh.

Solutions of carbolic acid, of average strength, have the power to check *suppuration*, and to correct the *fetor* of sloughing and ill-conditioned wounds. The methods of Mr. Lister's antiseptic treatment include a much more extended application of carbolic acid. Embracing the fermentation theory of M. Pasteur, Mr. Lister holds to the necessity of excluding germs from contact with wounded surfaces. Operations by the method of Mr. Lister must be performed under and in a spray of carbolic acid (one part to forty). The solution may be pulverized by the ordinary hand-ball atomizer, or better by a Siegle's steam atomizer. All knives, sponges, and ligatures must be "carbolized" before coming into contact with the wounded surface. The antiseptic dressing is thus described by Mr. Lister : "It consists of

two pieces of folded gauze and mackintosh (fine cotton cloth with a layer of caoutchouc), an anterior and a posterior one. The wound is covered with several thicknesses of gauze dipped in a solution of carbolic acid (one to forty), and over this is placed the folded gauze and mackintosh, of sufficient size to extend beyond the margins of the wound in all directions." The dressing is confined by turns of a "gauze bandage," and is allowed to remain undisturbed for from two days to a week, "the general rule being that the dressing should be changed on any day on which the discharge is observed to have extended beyond the edge of the folded gauze."

Antiseptic gauze consists of cotton cloth charged with the following : "One part of crystallized carbolic acid, five parts of common resin, and seven parts of solid paraffin "—the paraffin and resin are first melted together, and the acid is then incorporated by stirring. A very complicated process, too elaborate for insertion here, is described by Mr. Lister, for diffusing the above-described mixture equably through the cotton cloth. For lubricating instruments, especially catheters and bougies, he advises a solution of one part of carbolic acid in twenty parts of olive-oil. Carbolized silk sutures are "prepared by immersing a reel of the silk in melted beeswax, mixed with about a tenth part of carbolic acid, and drawing the thread through a dry cloth as it leaves the liquid, to remove superfluous wax."

The following is the University College formula for the preparation of carbolic-acid plaster : "Shellac, 75 ; carbolic acid, 25. Melt the shellac with 8 of the acid, and then add the remaining 17, and mix thoroughly. The mixture should be spread on linen, and should be coated with a solution of gutta-percha in bisulphide of carbon."

The admirable results in the treatment of wounds obtained by Lister have been fully confirmed by various competent observers (Nussbaum, Thiersch, Volkmann, Bardeleben), and, although objectors have risen to deny the superiority of the method, it has been shown that the ill-success complained of was due to inattention to the various details necessary.

Toxic Symptoms induced by Carbolic Acid when used externally.—The extraordinary extent to which carbolic acid is now applied in surgical practice renders it necessary to devote some attention to the symptoms indicating a dangerous degree of absorption. This form of poisoning occurs under two forms : one, sudden, the patient sinking into collapse immediately after the dressings are applied ; the other, occurring insidiously, after some weeks of treatment and applications of the antiseptic dressings. Kuster, of Berlin, relates five cases of the first form, in which the patients, after the dressings were applied, sank at once into a condition of collapse like the state of shock from a most formidable surgical operation. Only one of these cases recovered. The diagnosis of this toxic state from surgical shock

will be referred to presently. In the other form of poisoning the symptoms appear gradually, and are apt to be attributed to a commencing septicæmia. Loss of appetite, nausea, feverishness, headache, vertigo, and clonic spasms, are first experienced, prostration sets in, and a more or less profoundly comatose state develops. The onset of these symptoms, or the depression which initiates the morbid phenomena in the first form, occurs at a time when more favorable symptoms are properly expected. But the diagnosis is arrived at readily by an examination of the urine. The change in the color and the peculiar odor of the urine observed in carbolic-acid poisoning have been referred to, but the chemical tests are more important. According to Baumann, we have, in Sonnenberg's test, the best means of determining the presence of carbolic acid. This test depends on the fact that any carbolic acid in the urine unites with the sulphates to form the sulphocarbolates, and hence it consists in determining the amount of normal sulphates present. The urine is first acidulated with strong acetic acid, and baric chloride is then added in excess. A copious precipitate, consisting, for the most part, of baric sulphate, is formed, if the urine is healthy; but if it contain carbolic acid, scarcely any precipitate will be thrown down, because of the formation of soluble sulphocarbolates. The researches of Baumann have furnished us with an antidote of a chemical kind, which may be applied if there is time. He has shown that sodic sulphide forms in the body, with carbolic acid, the innocuous sulphocarbolate, and hence a soluble sulphate, as Glauber's salts, will be a proper antidote. As, however, the toxic action of carbolic acid is very speedy, the chemical antidote may not have time. Under these circumstances it will be found, probably, that the physiological antagonist is more speedy and effective. Atropine is apparently a most certain antagonist. It has succeeded in some very unpromising cases, and in my experiments on animals the results have been most favorable to the existence of the antagonism.

Carbolic acid enters into the composition of Morrell's antiseptic fluid, which is used as a disinfectant for general purposes, and for the preservation of bodies. The following is the formula: "Dissolve 13·5 parts of arsenious acid and 6·9 parts of sodic hydrate in 15 to 20 parts of water; add enough carbolic acid until the clear fluid, after stirring, appears turbid (that is, until the liquid is fully saturated with carbolic acid), and dilute with water to make 100 parts."

SULPHOCARBOLATES.—*Sodii Sulphocarbolas.* Sulphocarbolate of sodium.

Potassii Sulphocarbolas; Calcii Sulphocarbolas; Magnesii Sulphocarbolas.

Of these salts, the first-named is the most important, and is the only one official. The first step in the formation of these salts consists in the production of sulphocarbolic acid, obtained by dissolving one

part of crystallized carbolic acid in an equal weight of strong sulphuric acid. The next step consists in the formation of sulphocarbolate of barium, from which the other salts are obtained by double decomposition.

Sulphocarbolate of sodium occurs in transparent rhombic prisms, which are permanent in the air, dissolve in about five parts of water, and are also soluble in glycerin and alcohol. Most of the sulphocarbolates have a faint pinkish tint, and are, like the soda-salts, soluble in water, alcohol, and glycerin. The dose for internal administration ranges from ten to thirty grains. Saturated or weaker solutions may be employed topically.

These preparations, devised by Dr. Sansom, were intended to secure the antiseptic and antipyretic action of carbolic acid without any of the caustic and depressing action of the latter. In such septic diseases as *diphtheria*, the *eruptive fevers*, *puerperal fever*, they may be used freely. There seems little ground for the assumption that the carbolic acid is freed from its associates in passing through the organism, for the sulphocarbolates do not have the effects of carbolic acid, and the urine does not have the greenish, blackish, or smoky hue characteristic of the latter remedy. There can be little doubt that the sulphocarbolates are excellent topical applications to the inflamed mucous membrane, wherever accessible. The author has had good results from their use in acute inflammation of the fauces, in *tonsillitis*, in *catarrh of the nares*, in *otorrhœa*, and also in *gonorrhœa*. These salts are useful as deodorant and antiseptic applications to unhealthy wounds and ulcerated surfaces, to *aphthæ* in children, etc. Although the sulphocarbolate of sodium has been added to the new pharmacopœia list, it must be admitted that the sulphocarbolates do not maintain the position to which they were first introduced.

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Salix.—Salix. The bark of *Salix alba* Linné, and of other species of *Salix* (Nat. Ord. *Salicaceæ*).

Salicinum.—Salicin. A neutral principle obtained from the bark of *Salix helix* Linné, and of other species of *Salix*. Colorless, white, silky, shining crystals, permanent in the air, odorless, having a very bitter taste and a neutral reaction. Soluble in 28 parts of water, and in 30 parts of alcohol at 59° Fahr.; insoluble in ether or chloroform. (U. S. P.) Dose, ℈j—ʒij. So little soluble, it were better administered in a wafer, powder, or emulsion.

ACTIONS AND USES.—Salicin promotes appetite and the digestion—properties which it possesses in common with other bitters. It is an antiferment, and has antiseptic powers similar to quinine and salicylic acid. The latter is a derivative of salicin. It is destructive to bacteria and vibrio, and prevents the reaction of amygdalin and emulsin, and of ptyalin on starch. It does not produce very sensible effects even in large doses, and is without toxic activity. It has been used as a substitute for quinine in the cases of disease to the treatment of which the latter is applied, especially in the treatment of *intermittents*. It is, however, much inferior to quinine.

Salicin is an excellent stomachic tonic in *atonic dyspepsia*, and is a serviceable remedy to prevent the fermentations which take place in the foods in cases of *gastro-intestinal catarrh*. In the *chronic diarrhœa* of children, it has been employed successfully. The good results obtained from it in these cases are doubtless due to its antiferment properties and its lack of irritating qualities.

The most important use of salicin thus far proposed, is in the treatment of *acute rheumatism*—information which we owe to Dr. Maclagan. He concludes, as the result of his experience, that the more acute the case the more beneficial the remedy; that the good effects are always experienced within forty-eight hours; that, sometimes, the disease is at once arrested; that relief of pain and fall of temperature are the earliest effects produced. Maclagan gives from ten to thirty grains every two, three, or four hours, in powder mixed with water. "Fifteen grains every three hours is a medium dose."

Much confirmatory evidence has been published; but, on the whole, salicin is generally regarded as inferior to salicylic acid. There are conditions of the system, however, in which salicin should be preferred to any of its congeners. In those cases characterized by weak heart, whether from adherent pericardium, myocarditis, fatty degeneration, or other causes, salicylic acid may be dangerous. Again,

when the vaso-motor system is depressed, salicin is far safer. As the curative results obtained from salicin are but little inferior to those from salicylic acid, whenever the latter is contraindicated, the former may be confidently relied on, if efficiently administered.

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Acidum Salicylicum.—Salicylic acid. *Acide salicylique*, Fr.; *Salicylsäure*, Ger.

PROPERTIES.—Salicylic acid crystallizes in needle-shaped crystals, which are soluble in alcohol and ether, and in hot but not in cold water. It is without smell, and its taste is slight and not disagreeable. The solubility of salicylic acid in cold water is increased by the presence of neutral salts. Three parts of phosphate of sodium will render one part of the acid easily soluble in fifty parts of water. Borate of sodium is still more efficient in promoting the solubility of the acid, and, as boracic acid has properties corresponding to salicylic, the borate should be preferred for this purpose. It has been shown that ten parts of salicylic acid can be dissolved in one hundred parts of water, by the addition of eight parts of borax (Bose). The borax should be first dissolved by the aid of heat, and the salicylic acid should be added gradually to the hot solution of borax. On cooling, filtration is necessary to separate a small quantity of undissolved residue.

The dose of salicylic acid for internal administration ranges from ten grains to one drachm.

Sodii Salicylas.—Salicylate of sodium. Dose, grs. xv—ʒj. The best mode of administration is in the form of wafer, containing five to ten grains. These may be given rapidly until the requisite quantity has been swallowed. Salicylate of soda may be prepared extemporaneously by the addition of salicylic acid to a solution of bicarbonate of sodium. If the alkali is in excess, the resulting solution is brownish or purplish in color, and has a strong odor of wintergreen. This is not repulsive to most patients.

The following is a suitable formula: ℞ Acidi salicylici, ʒij; sodii bicarb., ʒj; aquæ, ℥ij. M. Sig.: A teaspoonful every two, three, or four hours.

ANTAGONISTS AND INCOMPATIBLES.—The mineral acids, the metallic salts, and the preparations of iron in general, are chemically incompatible. From the physiological standpoint, salicylic acid and the salicylate of soda are antagonized by the arterial and cerebral stimulants.

SYNERGISTS.—The effects of salicylic acid are increased in all di-