

PREPARATIONS OF COPPER.

APPLIED to the unbroken skin, the soluble salts of copper produce no visible effect. On sores they unite with the soluble albuminous substances, forming an insoluble albuminate, which coats the surface, and in an imperfect manner may take the place of the lost cuticle. The thin pellicle thus formed protects the delicate structures from the air, and the substances floating in it, and so promotes the healing process. Like many other metals, these salts condense the structures and constrict the blood-vessels, and so lessen the supply of blood to the part. They may even arrest hæmorrhage from the smaller vessels. They act as irritants to the delicate tissues, producing slight inflammation, with some smarting pain.

To arrest bleeding, and as an irritant to indolent sores, the sulphate is most employed, either in stick or solution, or as an ointment.

Indolent forms of impetigo, after resisting the more usual applications, will sometimes yield to sulphate of copper.

The solid sulphate may often be rubbed with conspicuous advantage along the edges of the eyelids when affected with tinea tarsai. The eyelashes should be previously cut off closely and the scabs carefully removed. Indeed, in every case where slight stimulation is required, this salt may be used. Milder in its action than nitrate of silver, it excites much less pain.

The soluble salts combine in the mouth with the liquid albuminous substances of this cavity, and precipitate them more or less completely. If used in quantity more than sufficient to do this, the mucous membrane itself is attacked in a manner altogether similar to the abraded skin. These salts possess a metallic styptic taste. The sulphate, in the solid form, may be applied with great advantage to the tongue when affected with either specific or simple psoriasis, or indolent sores. Painted in solution over the edges of the

gums in ulcerative stomatitis it generally quickly heals the ulcerated surfaces; but, on the whole, dried alum is to be preferred.

A weak solution of this salt painted over the mucous membrane will remove the white, curdy-looking coating of thrush, and prevent its renewal.

The soluble salts behave in the stomach in the same manner as in the mouth, and if taken in large quantities act as powerful irritant poisons.

These salts are emetic; the sulphate being speedy, and mostly effectual in its operation, is not unfrequently prescribed. A good way to give this salt as a vomit is to administer it in small and frequently-repeated doses. It generally produces one copious evacuation, neither purging nor producing much nausea or prostration. It is supposed to exert an especial action on the larynx, hence it is sometimes given in croup, and when it is necessary to expel any obstructing substances from the glottis by the mechanical efforts of vomiting.

In moderate doses these salts are astringent to the mucous membrane of the intestines. The sulphate, administered either by the mouth or by injection into the rectum, is often effectual in staying severe chronic or acute diarrhœa, whether depending on serious organic disease or not.

Copper salts, taken for a considerable time in small quantities, are said to give rise to a condition not unlike that produced by lead; for example, colic, with alternating constipation and diarrhœa; and it is even said paralysis of the upper extremities, undistinguishable from that of lead.

Salts of copper find their way into the blood, existing there probably as albuminates.

Copper salts have been given in cholera and epilepsy.

Solutions of the sulphate are employed in gonorrhœa, gleet, and leucorrhœa.

Copper is eliminated both by the urine and fæces.

PREPARATIONS OF ZINC.

THE members of this group are employed in a variety of ways as external applications.

Their common action is astringent and irritant; but on account of their different degrees of solubility, their varying affinity for water, and perhaps for the tissues, these properties are manifested in unequal degrees.

The chloride and iodide, from their high diffusion-power and great affinity for water, are the most energetic of the zinc salts. Yet even these remain almost inert on the skin, unless the cuticle is first removed, when they permeate the tissues, and destroy them for a considerable depth. The chloride at first produces a sensation of warmth, which increases to a burning pain, lasting seven or eight hours, by which time the tissues are destroyed, and a white eschar is formed, which separates in from seven to twelve days. The chloride and iodide, as we have just said, have hitherto been regarded as the most energetic salts of this series, but recently Mr. Marshall, of University College, has shown by experiments that the nitrate penetrates deeper than the chloride, destroying the tissues to a greater depth, and, according to the same authority, it possesses the further advantage of producing less pain than the chloride. These three preparations, but especially the chloride, are employed to destroy *nævi*, warts, condylomata, the skin affected with lupus, and the tissue of syphilitic ulcers.

The sulphate having a lower diffusion-power, its action is much more superficial. In common with the other soluble salts of zinc, it forms an insoluble compound with albumen, and by virtue of its astringency condenses the tissues and contracts the blood-vessels. As a stimulant and astringent it lessens the secretion, and promotes healthier growth of ill-conditioned, free-secreting sores or eruptions. In common with the chloride it is used as an injection in gonorrhœa or gleet.

A grain or two grains of chloride of zinc dissolved in a pint of water, and a little of this solution injected every hour of the day, is a useful injection for gonorrhœa. Rest, if possible, should be observed; but this is not indispensable to the success of the injection. If the frequent injection causes any pain in the testicles, they should be suspended in, and frequently fomented with, hot water; if, notwithstanding, the pain continues, and the swelling increases, the injection must be employed less often. If treated at its very beginning, this injection will often remove the disease in twenty-four to forty-eight hours.

A solution so weak as the one recommended is no better it may be objected than simple water; to which it may be answered, simple water does not cure with anything like the same rapidity. Moreover, if some of this solution is taken into the mouth, and retained there a few seconds, it will produce a decided roughness of the mucous membrane. Now, if the solution is strong enough to affect the mucous membrane of the mouth, it can certainly influence, in at least an equal degree, a similar, but more sensitive, structure in the urethra.

The carbonate and oxide are insoluble, or but very slightly soluble, in the animal fluids; and as these salts possess no affinity for water, their action on the tissues is very weak. They are, however, slightly astringent, and are useful, on account of this property, in ointment, or in powder. The ointment of the oxide is used as a mild stimulating application in eczema and impetigo, when, inflammation having subsided, the raw surface is left in an indolent state, with very little disposition to heal. Both the oxide and carbonate are used as dusting powder, and are, perhaps, the best powders for this purpose; but, as a rule, greasy applications are preferable. In inflamed conjunctiva, a weak solution of the sulphate dropped into the eye several times a day is often very useful. The same salt is occasionally employed as a gargle in relaxed sore throat, and is sometimes added to alum injections for leucorrhœa.

The more soluble preparations possess a metallic, styptic taste. None are employed in diseases of the mouth. The chloride has been used to destroy the exposed painful pulp of decayed teeth.

The carbonate in large doses produces some nausea and vomiting; but a full dose of the sulphate acts much more speedily, is a safe emetic, producing little prostration or nausea, and generally empties the stomach in one complete evacuation. It is therefore the best emetic in cases of poisoning, being far preferable to the slow and unsure action of ipecacuanha. It may be employed as an emetic in bronchitis or croup; in bronchitis, to expel the mucus from the bronchial tubes; in croup, the false membrane from the larynx; but other emetics are mostly preferred. The sulphate may be employed as an emetic, or in doses short of the induction of vomiting, in painful affections of the stomach, dependent on chronic inflammation of the mucous membrane. No satisfactory explanation has yet been given of the action of zinc salts as emetics. They vomit even if mixed with albumen. Injected into the blood, the sulphate excites vomiting.

On account of its slight solubility, the oxide exerts but little action on the stomach, little being dissolved unless much acid is present in the stomach.

The chloride is a corrosive poison. The sulphate, on account of its astringency, may be employed, like most other metallic salts, in diarrhoea. Its action must take effect on the upper part of the canal, since the portion escaping absorption must be speedily converted into an inert sulphide. The stomach may become habituated to the ingestion of very large doses of the sulphate, to the extent even of forty grains thrice daily, without obvious bad results, or without inducing either nausea or vomiting; or apparently any alteration in the mucous membrane of the digestive canal. The prolonged employment of such doses is imprudent, as it has been shown that superficial ulceration of the stomach may be produced.

Zinc colic has been described. The symptoms included constipation, vomiting, prostration with disagreeable taste in the mouth.

Zinc finds its way into the blood, and exists there probably as an albuminate.

The oxide and sulphate have been employed with advantage in epilepsy, and whooping-cough. We now possess a better remedy for epilepsy in bromide of potassium.

Sulphate of zinc is often very useful in chorea. Like tartar emetic, it succeeds best when given in doses sufficient to produce nausea, or even vomiting daily. To effect this, however, the dose must be rapidly increased sometimes to the extent of two grains every two hours daily, and it is astonishing how much of this drug can be borne, for I have given fifteen and sometimes twenty-two grains every two hours without producing nausea. This salt thus administered often effects striking improvement, but these heroic doses after a time excite pain at the pit of the stomach with loss of appetite. When this happens, another emetic, like tartar emetic, may be substituted: when given to excite nausea it is a good plan to administer a dose before breakfast. It is a noteworthy fact that most emetics are useful in chorea. Do they act by exciting the physiological state of nausea, or by their operation on the nervous centres through which emetics produce nausea? As improvement occurs in many cases independently of nausea, the latter suggestion is probably the more feasible. Zinc salts are reputed to be powerful nervine tonics, an expression meant I suppose, to imply that they promote the nutrition of the nervous system, and some authorities attribute to this property their influence over chorea.

In certain forms of hysteria zinc salts prove useful, especially in the shape of valerianate of zinc.

These substances are reputed to be antispasmodic. When they produce nausea, no doubt they indirectly act thus; but it is doubtful whether non-emetic doses are efficient antispasmodics.

The oxide in two-grain doses, given nightly, often controls profuse colliquative sweating. It is also said to check the profuse secretion from the bronchial mucous membrane in some forms of bronchitis.

Dr. Hammond recommends oxide of zinc, in two to five-grain doses, for nervous headache. Bismuth he also finds useful.

This metal does not become fixed in the body, nor does it produce chronic affections like lead or mercury. Zinc salts are eliminated from the body less rapidly than some other metals. They pass out of the system in small quantities only by the urine. It has been thus asserted that very little of the salts pass into the blood. This may be true; but the fact that the chief part may be re-obtained from the fæces is no proof of this statement, as zinc, like many other metals, is probably excreted by the mucous membrane of the intestines, and with the bile.

PREPARATIONS OF ANTIMONY.

TARTAR emetic, in the form of ointment, excites in the skin a characteristic inflammation, at first papular, then vesicular, and lastly pustular. The rash thus runs the course of the eruption of small-pox, and in each stage simulates it very closely. Yet there are points of difference distinguishable to a practised eye. Like small-pox eruption, this rash often scars; moreover, the action of this ointment, being capricious and painful, renders it an unsuitable external application.

Tartar-emetic ointment has been used as a counter-irritant to obtain a powerful action of some continuance; for instance, to the scalp in tubercular meningitis.

Chloride of antimony is a powerful escharotic, but it produces an ill-conditioned, slow healing sore.

Tartar emetic being the most used member of this group, our remarks will apply to this preparation, except when the contrary is stated.

Antimony preparations are not used as topical applications to the mouth. After small medicinal doses the stomach experiences a slight sensation of soreness—a sensation easily mistaken for hunger. Pushed yet further, the medicine produces increased secretion of mucus from the stomach and intestines to the extent of inducing numerous moist motions; and diarrhœa with colic may set in. The bronchial mucous membrane also yields an increased secretion, and probably the secretion of the whole mucous tract is augmented.

Antimony is never used as a purgative; in fact, opium is frequently given in combination with tartar emetic, expressly to prevent purgation. Large doses excite nausea and vomiting. As an emetic, tartarized antimony produces considerable depression, with much nausea; and the repeated vomiting it excites is accompanied by great straining. It is somewhat tardy in its action, and may require twenty minutes to half an hour before it operates. This tardy action disqualifies it as an emetic in cases of poisoning. Like all nauseating medicines, it produces weakness and prostration, but in a greater degree than most other emetics.

Majendie has shown that tartar emetic, when injected into the veins, excites nausea even after the removal of the stomach and its substitution by a pig's bladder; hence it has generally been held that this salt produces vomiting, not by its effects on the stomach, but on the nervous centres. Grimm who is confirmed by Kleimann and Simonowitsch, finds that it excites vomiting more slowly when injected into a vein, than when administered by the stomach, whence he concludes that it produces vomiting by its effects on the terminations of the nerves of the stomach. He disposes of the difficulty raised against this view by Magendie's experiment, by assuming that tartar emetic excites nausea, by its effects on the termination of the nerves of the œsophagus and intestines.

Tartar emetic was formerly employed to induce muscular

weakness and the relaxation of spasm, to facilitate the reductions of dislocations and hernia, but in such cases chloroform has now completely superseded it.

Trousseau taught that the action of this medicine was much influenced by food. With low diet it produces its constitutional effects, but with a full diet it excites vomiting and purging. Its action is further modified by the quantity of water administered with it: this being small in bulk, vomiting takes place; if large, diarrhœa is produced. It was further observed by Trousseau that certain substances modify the effects of antimony; for wine and acid fruits, both fresh and preserved, develop the emetic and purgative properties of the drug.

The soluble antimony compounds easily enter the blood, but the form they there assume is unknown. Possibly the oxide of the metal, either in the stomach, intestines, or blood, combines with albumen, forming an albuminate. Antimony compounds, it is said, do not combine with albumen, except in acid solutions, when an insoluble compound is formed.

It has been proved experimentally that the administration of tartar emetic increases the insensible perspiration, chiefly of the skin. Since at the stage of nausea all emetics increase the sweat, it is difficult at present to decide whether tartar emetic affects the perspiration in any other way. Tartar emetic wine is commonly given in fevers as a diaphoretic.

It is convenient here to notice the influence tartar emetic exerts on the excretion of carbonic acid and urea. Under its influence these excrementitious substances are both eliminated in greatly increased quantity. Whether the medicine is to be considered a mere eliminator of these products, or whether it likewise increases their formation, the experiments are not sufficient to determine, as in no instance were they continued long enough to decide this question.

In common with other emetics, this remedy is sometimes given in large doses to produce profuse nausea and vomiting, and it is held by many eminent authorities, among whom

Dr. Graves may be mentioned, that the strong impression thus made on the system will cut short acute specific fevers and inflammations. Graves held that in this way typhus might be summarily checked. The period for the exhibition of emetics, he states, is very short; for after the lapse of twenty-four or thirty-six hours from the occurrence of the rigor, they will not succeed in arresting the disease.

Many cases of ague may be cured by the impression emetics make on the system. The action of quinine may be aided by an emetic administered each morning, and cases which resist quinine often yield immediately to the united action of quinine and emetics. Ipecacuanha and other emetics should be preferred to antimony.

Given to a healthy person, antimony will not lower the temperature of the body, if one experiment may be accepted as sufficient to settle this point. The author gave to a strong young man tartar emetic in half-grain doses every ten minutes for nearly seven hours, inducing great nausea and vomiting, with profuse perspiration, but during the whole time the temperature remained remarkably constant, not varying more than 0.4 Fahr., an amount of variation frequently observed in health.

Of late years, antimony has been much employed in acute pneumonia, and the general experience of the profession is strong in its favour. Discretion, however, must be used in adapting the dose to the strength of the patient, who, if weak, must take alcoholic stimulants in conjunction with the tartar emetic. In many cases of pneumonia, under the influence of antimony the pain in the side gives way, the expectoration from rusty changes to bronchitic, the pulse and breathing become reduced in frequency, and the further spread of the inflammation is checked.

Other kinds of acute inflammation may be similarly treated, although the good results are not so apparent as in pneumonia. It is necessary to give the tartar emetic at the very beginning, otherwise its power over pneumonia is much less marked. In inflammation, one-fourth to one-half grain may

be given every two or three hours, or a lesser proportionate dose every hour.

Treated in this way, tonsillitis, pleurisy, orchitis, bronchitis, puerperal peritonitis, inflammation of the breast, whitlow, and other inflammatory affections, may be shortened and made milder. Antimony may also be employed with considerable success in chronic bronchitis, when the expectoration is copious, frothy, and difficult to expel.

In the following disease tartar emetic is invaluable.

Young children, six to twelve years old, on the slightest exposure to cold, are attacked with much wheezing and some difficulty of breathing, sometimes so urgent as to compel them to sit all night propped up with pillows. The expectoration may be pretty abundant, but children of this age do not generally expectorate. On listening to the chest, there is heard much sonorous and sibilant, with perhaps a little bubbling, rhonchus; but this last is often absent. The wheezing is audible for a considerable distance, and sometimes the noise is so great as to be heard many rooms off. Occasionally the cough is troublesome, and on each exposure to cold the voice may become hoarse, and the cough hollow and barking. Some children are thus afflicted whenever the weather is cold, even in summer, and may not be free the whole winter; with others the attack lasts only a few weeks or days. This affection sometimes follows measles. It is compared by the mother to asthma, with which, if not identical, it is certainly allied.

The best way to prepare and administer the solution of this salt is to add a grain of it to half a pint of water; of this give a tea-spoonful every quarter of an hour for the first hour, afterwards hourly. If the wheezing comes on at night, it is sufficient to give the medicine only at this time. The good effects of the medicine are speedily evident; for the child is often greatly benefited on the first night of its employment. So small a dose, it may be thought, must be inefficacious, but when first given it very generally produces vomiting once or twice in the day. As it is not necessary to

produce sickness, the dose in this case must be still smaller.

There is, however, an affection somewhat similar to that just described, which it is necessary to discriminate, since it is unaffected by tartar emetic. It occurs in children a few months old, and consists of a loud rattling, which is obviously caused by mucus in the throat or larynx. There is no bronchitis, or, if it exists, this is a mere coincidence; nay, sometimes on the occurrence of bronchitis the complaint in question ceases for a time. It is brought on and aggravated by cold, and may last, with some fluctuations, many months. In some cases the rattling is worse in the day, but is usually worse at night.

Antimony in small hourly doses is very useful in the acute catarrh of children, which is not uncommonly accompanied by vomiting and diarrhoea probably due to catarrh of the intestines. The intestinal canal is sometimes, but most frequently the lungs are first attacked. The tartar emetic generally quickly stays the vomiting and diarrhoea, but often takes a longer time to control the bronchitis.

Antimony acts as a depressant on the heart, weakening its contractions, and increasing their frequency. These results depend in part on the nausea it produces.

According to the recommendation of Graves, it may be usefully employed in typhus and other fevers, when there is much excitement and furious delirium, symptoms which may be generally calmed by the exhibition of this drug. As wakefulness is generally present, being indeed, the cause of the excitement and delirium, opium should be added to the antimony. The combined influence of these remedies calms the excitement, and induces refreshing sleep, out of which the patient wakes refreshed and free from delusions. Judiciously employed, these remedies may save an almost hopeless life. Each drug appears to assist the action of the other; and the relative doses must be determined by the circumstances of the case. In furious delirium the tartar emetic must be given in full, and the opium in small quantities; while, if wakeful-

ness is the chief symptom, the delirium being not very boisterous, the dose of tartar emetic must be reduced, and the opium increased.

Graves advises one-fourth to one-half of a grain of the salt every hour or two hours, and to be discontinued when it produces bilious stools. This treatment is very useful in the delirium which usually sets in about the ninth or tenth day of typhus.

The mania and sleeplessness of delirium tremens generally gives way to the same treatment.

Puerperal mania may be treated in the same way, although probably bromide of potassium and chloral give better results.

Tartar emetic given to the extent of producing nausea and vomiting once or twice a day is sometimes useful in chorea. (See sulphate of zinc.) Increasing doses must be given, as the system appears soon to tolerate it. Other remedies, however, are more efficient.

Tartar emetic, in doses of 1-36th to 1-48th of a grain, three or four times a day, may be given with advantage in strumous ophthalmia. Sharp purgation at the commencement of the treatment is highly useful.

In acute poisoning by tartar emetic, violent and continuous vomiting occurs, accompanied with a diarrhoea of bilious and bloody stools. The common symptoms of gastro-enteritis, and sometimes of peritonitis, are present. The prostration is intense, and profound and repeated faintings take place. The respirations and the pulse are said to be reduced both in frequency and in strength; others assert that the pulse is more frequent.

The *post-mortem* appearances are, inflammation of the stomach and intestines, but not often of the gullet. The peritoneum may be, and, according to Harley, the rectum often is, inflamed, and usually some inflammation of the lungs is observable, tending to make it probable that tartar emetic exerts an especial action on these organs.

Applied to a sore or to the broken skin, or injected into

the veins, antimony still excites nausea and vomiting, thus manifesting an especial affinity for the stomach or nervous centres.

In the treatment of poisoning by tartar emetic, the vomiting should be promoted by warm demulcent drinks, while strong tea or coffee, tannin, or decoction of oak bark, should be diligently administered.

The statements concerning the influence of antimony on the urine are conflicting. The probable effect of tartar emetic on this excretion is to lessen the amount of water and chloride of sodium, owing to increased perspiration. Urea is greatly increased, and apparently in proportion to the dose of the antimony. The pigment and uric acid are also increased, but in a less degree.

The golden sulphuret increases all the constituents of the urine, especially the urea, and sulphuric acid (Parkes on Urine.)

Antimony is separated chiefly by the kidneys; some, however, passes with the bile, and perhaps by the intestines. A portion is retained in the body.

PREPARATIONS OF ARSENIC.

Since all arsenic salts produce the same symptoms, it is probable that in the blood they ultimately assume the same form.

Dry arsenious acid produces no changes in the unbroken skin, but in wounds or sores it excites very active inflammation, sufficient, if the application is a strong one, to destroy the tissues for some depth. Arsenious acid has long been used to destroy warts, condylomata, cancerous growths, etc.

It may be applied pure, or mixed in variable quantities with some bland powder, as starch. At times this application has enjoyed a high reputation, whilst at other times it has fallen