small fatty tumors, *abscesses*, and *hydrocele*, may be cured by injecting five to ten drops of a strong solution (℈j—℥ ij). In the case of cysts and hydrocele, the contents may be allowed to escape through the needle, and then the irritant solution be injected. More or less active inflammation follows, and the sac, after a variable stage of suppuration, becomes entirely obliterated.

Old and intractable cases of *sciatica* that resist other means, including hypodermatic injection of anodynes, are sometimes permanently relieved by injecting deeply into the neighborhood of the affected nerve ten to twenty drops of a solution of nitrate of silver. Suppuration usually follows, and the local inflammatory process terminates the previously-existing nerve-lesion (parenchymatous substitution).

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Cuprum.—Copper. *Cuivre*, Fr. ; *Kupfer*, Ger.

Cupri Acetas.—Acetate of copper. Deep-green, prismatic crystals, yielding a bright-green powder, efflorescent on exposure to air, odorless, having a nauseating, metallic taste and an acid reaction. Soluble in 15 parts of water, and in 135 parts of alcohol at 60° Fahr. Dose, gr. $\frac{1}{10}$—gr. $\frac{1}{4}$.

Cupri Sulphas.—Sulphate of copper. Blue vitriol. In blue crystals, slightly efflorescent in the air, and soluble in 2·6 water at 60° Fahr. Ammonia throws down from the solution a precipitate, which is wholly dissolved when the alkali is added in excess. Dose, gr. $\frac{1}{6}$—gr. ss.

Cuprum Ammoniatum.—Ammoniated copper. (Not official.) A deep, azure-blue powder, having an ammoniacal odor, and a styptic, metallic taste. It is soluble in water. Dose, gr. $\frac{1}{6}$—gr. j.

Antagonists and Incompatibles.—Alkalies and their carbonates, lime-water, mineral salts (except the sulphates), iodides, and most astringent vegetables, are chemically incompatible with the salts of copper. In cases of poisoning, white of eggs and milk should be given freely, but evacuation of the contents of the stomach is necessary, for the albuminate of copper is not devoid of toxic power. The most

effective chemical antidote is said to be the ferrocyanide of potassium, forming the insoluble ferrocyanide of copper. Magnesia has also been proposed, but it should not be relied on to the exclusion of albumen and ferrocyanide of potassium, nor should any antidote be used without evacuating the stomach contents by emetics or the stomach-pump.

Synergists.—The salts of lead, tin, zinc, mercury, silver, gold, favor the therapeutic action of the copper-salts. All of these agents agree in this : they promote waste, and affect the functions of the nervous system secondarily. All unfavorable hygienic conditions, which depress the functions of the body, increase the activity of the copper-salts.

Physiological Actions.—The salts of copper have a styptic, metallic taste. When a poisonous dose of a copper-salt has been taken the following symptoms, referable to the digestive organs, appear : A strong metallic taste, burning and constriction of the throat, increased flow of saliva, burning pain at the epigastrium, with griping and colic-pain of the intestines, nausea and vomiting. The vomited matters have usually a bluish or greenish color, and the intestinal evacuations, which begin in a few minutes after the poison has been swallowed, are dark-greenish and frequently bloody. These are the symptoms produced by the irritant poisons, and have no special characters, except, it may be, the *color* of the evacuations. The salts of copper, being diffusible substances, quickly enter the blood, and the systemic symptoms which follow are referable to the nervous system and the organs of excretion. In the blood, as is the case with the other metallic poisons, copper probably exists in the form of an albuminate in close relation to the red blood-globules. The breathing becomes short, hurried, and labored ; the pulse small, quick, and weak ; the skin cold and perspiring, and restlessness, headache, trembling, cramps, vertigo, and stupor, are followed by convulsions (clonic or tetanic), paralysis, and insensibility.

Inhalation of cupreous fumes, as in certain occupations in the arts, the slow introduction of small quantities, as occurs sometimes from cooking acid fruits in copper vessels, or the prolonged medicinal administration of moderate doses of a copper-salt, will produce the symptoms of chronic or slow poisoning. When inhaled, the symptoms first observed are those of bronchial irritation and bronchial catarrh (Hirt). Internally administered, a gastro-intestinal catarrh is produced, epigastric pain is experienced, nausea, vomiting, colic, tenesmus, and dysenteric discharges, and complete anorexia occur. The loss of appetite, and the interference with digestion, as well as the injury done to the red blood-globules, impair the strength and increase the waste of the tissues. A purplish line along the margin of the gum has been observed, salivation and ulceration of the gums not unfrequently occur, and occasionally jaundice is present as one of the symptoms. As re-

gards the nervous system, headache, muscular trembling, paresis of the limbs, and sometimes paralysis, altered sensations, defects of co-ordination, impaired mind, result. These nervous symptoms, with bronchial and gastro-intestinal catarrh, are usually grouped together in the case of chronic cupreous poisoning in artisans.

Copper is eliminated by the liver, intestinal canal, salivary glands, and kidneys. As is the case with the other metallic poisons, copper tends to accumulate in the liver.

THERAPY.—The sulphate of copper is one of the remedies sometimes effective in the *vomiting of pregnancy*. For this purpose not more than one twentieth of a grain, three times a day, is admissible. ℞ Cupri sulphat., grs. ij ; aquæ destil., ʒ ss. M. Sig.: Six drops a dose.

As sulphate of copper is a very prompt and effective emetic, it is frequently resorted to in cases of *narcotic poisoning*. ℞ Cupri sulphat., grs. vj ; aquæ destil., ʒ ij. M. Sig. : *A tablespoonful every fifteen minutes until vomiting ensue.* It may be used under the same circumstances, but is by no means so desirable *an emetic, in croup*, as subsulphate of mercury. Minute doses of sulphate of copper render excellent service in *gastro-intestinal catarrh*, especially when the bowels are relaxed. ℞ Cupri sulphat., gr. j ; ext. nucis vom., grs. iv. M. Ft. pil. no. xvj. Sig.: One three times a day before meals. When the food taken gives rise to colic, which is quickly followed by the inclination to stool, there should be combined with the above prescription one grain of morphine sulphate. When the constipation coexists with intestinal catarrh, the following prescription is useful: ℞ Cupri sulphat., gr. j ; ext. physostigmæ, ext. belladonnæ, ext. nucis vom., āā grs. iv. M. Ft. pil. no. xvj. Sig. : One pill, three times a day, before meals.

The sulphate of copper is a most useful remedy in *acute dysentery*. ℞ Cupri sulph., gr. ss ; magnesiæ sulph., ʒ j ; acid. sulph. dil., ʒ j ; aquæ, ʒ iv. M. Sig. : A tablespoonful every four hours. After the acuter symptoms have subsided, the sulphate of copper may be given with morphine and opium. Of all the metallic astringents employed for this purpose, sulphate of copper is the most effective in *chronic diarrhœa* and *chronic dysentery*. ℞ Cupri sulphat., grs. j ; morphinæ sulph., gr. j; quininæ sulph., grs. xxiv. M. Ft. pil. no. xij. Sig.: *One pill three times a day.* Sulphate of copper is indicated when there are present colic-pains, tenesmus, and the stools, partly feculent, contain mucus streaked with blood. When *tolerance* is established, the quantity of copper in the above formulæ may be increased slowly to one fourth of a grain. Rarely can more than one twelfth of a grain be given to an adult unaccustomed to its use, without causing very unpleasant nausea and depression.

The *dysentery and cholera infantum* of children, and the *chronic entero-colitis* which sometimes succeeds to measles, are often remarkably benefited by minute doses of sulphate of copper. ℞ Cupri sulphat., gr. j ; tinct. opii deodor., gtt. viij ; aquæ destil., ʒ iv. M. Sig. : *A teaspoonful every two, three, or four hours,* for a child from one to two years of age.

The sulphate of copper is a useful palliative astringent in the *diarrhœa of phthisis*. It should be combined with opium.

Kissel regards the salts of copper as curative in *pneumonia*, and the preparation which he prefers is the tincture of the acetate (Phar. Ger.). The mortality under this treatment was only 4·3 per cent. Ammoniated copper has been used recently with remarkable success in the treatment of *facial neuralgia*. It must be pushed (Féréol).

The salts of copper, especially the *cuprum ammoniatum*, are among the numerous remedies employed in the treatment of *epilepsy, chorea*, and *hysteria*. Successful results have, it is true, been obtained by the use of these remedies, but at the present time they are rarely employed.

EXTERNAL USES.—The salts of copper do not act very energetically on the unbroken integument. Applied to wounds they are astringent—that is, they combine with albumen, contract the tissues, and coagulate the blood. A crystal of sulphate of copper may be used *to arrest bleeding from small wounds*, e. g., from *leech-bites*. *Indolent ulcers with flabby granulations* can be stimulated to a renewed and more healthy activity by touching the affected surface with a crystal of sulphate of copper, or by frequent application of a solution (grs. ij —grs. x— ʒ j). The following is an excellent injection in *gonorrhœa* after the acute stage : ℞ Cupri sulph., grs. iv ; morphinæ sulph., grs. viij ; liq. plumbi subacetat., ʒ j ; aquæ rosæ, ʒ iv. M. Sig.: *As an injection.* In that troublesome affection, *granular lids*, the sulphate of copper may be rubbed over the everted lid once a day with advantage. The application gives great pain, and is immediately followed by intense hyperæmia, which, however, subsides in a few hours, leaving the conjunctiva in much better condition than before.

In *scabies*, a solution of sulphate of copper (ʒ j—Oj) has been used with great success, the lotion being applied after the crusts have been thoroughly removed with soap and water. An ointment of acetate of copper (grs. x— ʒ j) is a very effective application in *herpes circinatus* (ringworm). The following formula has been recommended in *mentagra :* ℞ Cupri sulph., ʒ j ; zinci sulph., ʒ ss ; aquæ laur.-cerasi, ʒ jss ; aquæ destil. ad ʒ xvj. M. Sig.: *Lotion.* The acetate and carbonate of copper are very effective remedies in *tinea sycosis*. ℞ Cupri carb., ʒ ij ; adipis, ʒ j. M.

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Plumbum.—Lead. *Plomb*, Fr.; *Blei*, Ger.

Plumbi Oxidum.—Oxide of lead. Litharge. In small yellowish or orange-colored scales, insoluble in water, but almost wholly soluble, with slight effervescence, in dilute nitric acid. The solution is affected by potassa, like that of carbonate of lead in the same acid.

Emplastrum Plumbi.—Lead-plaster. Litharge and olive-oil.

Plumbi Acetas. — Acetate of lead. Sugar of lead. In colorless crystals which effloresce on exposure to the air. It is dissolved by distilled water, with a slight turbidness, which is removed by the addition of vinegar. With this solution carbonate of sodium produces a white, iodide of potassium a yellow, and hydrosulphuric acid a black precipitate. Upon the addition of sulphuric acid, vapor is evolved, having the smell of vinegar. Dose, gr. ss—grs. v.

Liquor Plumbi Subacetatis.—Solution of subacetate of lead. A colorless liquid of the specific gravity of 1·267. It is decomposed by exposure to the air, carbonate of lead being formed. When added to a solution of gum it occasions a dense white precipitate.

Liquor Plumbi Subacetatis Dilutus.—Diluted solution of subacetate of lead. (Solution of subacetate, ʒ iij ; distilled water, Oj.)

Ceratum Plumbi Subacetatis.—Cerate of subacetate of lead. Solution of subacetate of lead, 20 parts ; camphor cerate, 80 parts.

Plumbi Carbonas.—Carbonate of lead. A white substance in powder or pulverulent masses, insoluble in water, but soluble, with effervescence, in dilute nitric acid. Potassa added to the solution produces a white precipitate, which is wholly dissolved by an excess of the alkali. Heat renders it yellow, and, with the aid of charcoal, reduces it to the metallic state.

Unguentum Plumbi Carbonatis.—Ointment of carbonate of lead. (Carbonate of lead, 10 parts ; benzoinated lard, 90 parts.)

Plumbi Nitras.—Nitrate of lead. In white, nearly opaque, octahedral crystals, permanent in the air, and of a sweet astringent taste. It is soluble in seven and a half parts of cold water, and in alcohol. Its solution is precipitated black by hydrosulphate of ammonium, white by ferrocyanide of potassium, and yellow by iodide of potassium.

Plumbi Iodidum. — Iodide of lead. A bright-yellow, heavy, inodorous powder, fusible and volatilizable by heat, and soluble in twelve hundred and thirty-five parts of cold, and one hundred and ninety-four parts of boiling water. A hot saturated solution, on cooling, deposits the salt in brilliant, golden scales.

Unguentum Plumbi Iodidi.—Ointment of iodide of lead. (Iodide of lead, 10 parts ; benzoinated lard, 90 parts.)

ANTAGONISTS AND INCOMPATIBLES. — Natural waters containing lime, sulphates, carbonates, carbonic acid, mineral acids and mineral salts, vegetable acids, alkalies, iodide of potassium, the vegetable astringents in general, albuminous solutions, and the preparations of opium, are incompatible. In cases of poisoning by acetate of lead, the proper antidotes are the sulphates of soda or magnesia, phosphate of soda, milk, and albuminous solutions. Emetics and the stomach-pump should be used.

SYNERGISTS.—Cold, digitalis, ergot, veratrum viride, and agents acting similarly, favor the influence of acetate of lead over the circulatory system. Copper, mercury, antimony, and remedies promoting waste, increase the depressing effects of lead on the nutrition of the body.

PHYSIOLOGICAL ACTIONS.—The acetate is astringent ; that is, it combines with albumen to form compounds, for the most part insoluble in water and in acids. All the salts of lead are more or less toxic. As the acetate, which is most frequently the preparation taken, has a sweetish taste, mistakes not unfrequently happen ; but the after-taste is decidedly astringent and slightly metallic. As the combination of the salts of lead with albumen takes place on contact, this action ensues in the mouth in part, and is completed in the stomach. Any part of the lead reaching the intestinal canal must be converted into the insoluble sulphide. A very large quantity of the acetate of lead is required to produce a fatal effect ; not less than an ounce. When swallowed in this quantity and retained, it produces intense gastric irritation, sometimes choleriform symptoms, numbness, paralysis, coma, collapse. Owing to the fact that so large a quantity of acetate of lead will be rejected by vomiting, cases of acute poisoning rarely terminate fatally, and are infrequent. On the other hand, chronic poisoning by lead is very common, owing to the use of cosmetics and hair-dyes containing lead, the use of food preserved in tin cans soldered with lead, and to the contamination of drinking-water. Very rarely is the acetate of lead so persistently used in medical practice as to produce toxic symptoms.

When lead is slowly introduced into the organism in small doses, the first symptoms usually observed are loss of appetite, failure of strength, more or less wasting, paleness of the face and of the integument generally, and constipation. The joints become the seat of rheumatoid pain ; there is dry colic, the pain of which is assuaged by pressure ; and the muscles of the abdominal parietes are also seized with neuralgia. At the same time the liver diminishes in size, the abdominal fat disappears, the intestines are contracted, the belly is drawn in toward the spinal column. Coincidently with the contrac-

tion of the liver, the skin assumes an icteroid hue, the conjunctivæ become yellow, and the urine is tinged with the biliary coloring matters. At this time may be observed the so-called "blue line" along the margin of the incisor teeth — a slate-colored line, probably due to a deposition of the sulphide of lead, and found only, according to the author's experience, in those not accustomed to the use of a tooth-brush. The mucous membrane of the lips and mouth has often a bluish or slate-colored tint, and sometimes brownish pigment-deposits are seen on the lips near the teeth, and on the gums. Albuminuria may exist at this time, but it is commonly present further on in the history of these cases. Lead may cause that condition of hyperalbuminosis which eventuates in albuminous urine, but probably it in most cases hastens the development of changes in the kidneys already impending. As Garrod has conclusively shown, the use of lead, or its slow introduction through unknown channels, hinders the conversion of uric acid into urea, and favors the deposition of urate of soda about the joints: hence the arthritic pains which accompany the other symptoms of chronic lead-poisoning, and the intimate relation of the presence of lead in the organism and gouty attacks.

The symptoms thus far sketched are chiefly those due to the influence of the agent over the oxidation processes of the body in general. It is necessary now to consider the action of lead on the nervous system. Lead *gastralgia* is an early symptom, in part due to the fact that the metal acts directly on the nerves of the stomach, but it is also a symptom of the action of the poison on the central nervous system. Lead *arthralgia*, already referred to, is frequently an affection of the intra-muscular nerves, and has its seat more especially in the flexor muscles. The swelling of the joints and the joint-pains are doubtless due, as already explained, to the deposition of the urates in the joints themselves, but the term arthralgia is used to describe that form of pain about the joints produced by lead. Impaired sensibility to touch is also one of the phenomena of lead-poisoning. This *lead-anæsthesia* is found about the neck, chest, the forearms (their palmar face), hands, and fingers, and is symmetrically distributed on the two sides. Anæsthesia of the optic (*amaurosis*) is also a result of the direct action of lead, but dimness of vision and a sluggish pupil may also be due to the albuminuria which is so frequently present. *Paralysis* of the common extensors of the fingers and of the supinators, while the power of the flexors and pronators is much less diminished, constitutes that very striking symptom of lead-poisoning, "the drop-wrist." When the arms are raised the hands drop forward and to the palmar face of the forearm, from an inability of the extensors to hold them up. Paralysis may invade the laryngeal muscles, producing *aphonia*. Sometimes the paralysis has the hemiplegic form, and, still more rarely, the paraplegic. At the beginning of the paralysis, the muscular irritability is preserved, but it soon lessens, and is lost finally, so that the muscles cease to respond to the faradic current. For some time after the induction current fails to excite contraction, muscular movements may be obtained by a slowly-interrupted galvanic current.

Death may result from the saturnine cachexia, by the gradual failure of nutrition, and by the extension, finally, of the muscular paralysis to the muscles of respiration. Death may occur much earlier, by the development of those symptoms to which has been applied the term *lead-encephalopathy*—a form of disease characterized by delirium and convulsions, ending in fatal coma.

Lead is very fatal to the life of the fœtus, and women the subjects of the saturnine cachexia abort early, or produce stillborn children.

After death, lead is found in various organs of the body, and relatively in large amount in the brain. It is also largely deposited in the substance of the affected muscles and nerves, and the destruction of the Hallerian irritability, the disappearance of the striation and the granular condition of the nerves, are probably due to the direct action of the metal. Lead, also, like the other minerals, tends to accumulate in the liver; much of it is probably eliminated by the intestinal glands and skin, and some passes out by the kidneys.

The treatment of lead-poisoning is prophylactic and curative. Among the former are, personal cleanliness, frequent bathing, the use of sulphuric-acid lemonade, the habitual employment of milk in large quantity as a food, and the avoidance of all sources of contamination. Among the curative measures must be placed first, large doses of the iodide of potassium, purgative doses of Epsom salts, and sulphur-baths. The affected muscles should be early faradized to prevent atrophic changes. When they fail to respond to a faradic current, a slowly-interrupted galvanic current should be used, and after a time the faradic irritability may be recovered.

THERAPY.—Acetate of lead is one of the astringent remedies employed to arrest *hæmatemesis*. It is more especially adapted to the vomiting of blood which accompanies *gastric ulcer*. This salt exercises a favorable influence over the course and progress of gastric ulcer; it allays pain and local inflammation, and modifies the ulcerated surface. In *chronic gastric catarrh* with *gastralgia* and *pyrosis*, it has given great relief. Notwithstanding the chemical incompatibility, it may be advantageously combined with morphine in painful stomach-affections. The most frequent use of the acetate of lead in gastro-intestinal disorders is in the treatment of the various forms of *diarrhœa*. It is an excellent remedy in the *summer diarrhœa of children*. ℞ Plumbi acetat., grs. viij; acid. acetic., gtts. vj; tinct. opii deodor., gtts. iv; aquæ destil., ℥ j. M. Sig.: A teaspoonful every two, three, or four hours for a child two years of age. In *choleraic diarrhœa*, acetate of

lead is one of the most useful astringents: ℞ Plumbi acetat., grs. xxiv; pulv. opii, grs. xij; pulv. camphoræ, ʒ ss; sacch. alb., q. s. Ft. pulv. no. xii. Sig.: One powder every hour or two. It is sometimes preferable to administer the acetate of lead in solution, when the formula above given for children may be used in corresponding dose for adults. Probably, the most generally successful remedy for the *diarrhœa of phthisis* is a pill containing equal parts of acetate of lead and opium. The *diarrhœa of typhoid* may also be restrained by acetate of lead and opium; but generally bismuth is more suitable than acetate of lead. In *acute* and *chronic dysentery* lead is often a useful astringent. Enemata of lead and morphine (℞ Plumbi acetat., grs. iv; morphinæ acetat., gr. ss; aquæ fervid., ℥ j) allay the tenesmus of *acute dysentery*. Enemata of corresponding strength to age, of the same composition, are very useful in the *cholera infantum* of children.

Although the salts of lead undergo important chemical changes in the intestinal canal, and are probably very much modified in composition before they enter the blood, yet there is no doubt about their power to affect remote parts. The value of acetate of lead in various forms of *hæmorrhage* has been attested by an immense clinical experience. Thus, in *hæmoptysis*, it is a most useful hæmostatic. Careful observations on a case of severe and protracted pulmonary hæmorrhage demonstrated that five grains of the acetate, every three hours, exercised a remarkable influence over the arterial tension and the action of the heart. Its effects are similar to those of digitalis: it slows the action but increases the power of the heart, while at the same time it elevates the tension of the arterioles. The astringent is, however, a dynamical and not a chemical action, doubtless. There is, therefore, a fitness in the prescription of Oppolzer for *caseous pneumonia:* ℞ Inf. digitalis, ℥ iv; plumbi acetat., ↄ j; tinct. opii, ʒ j. M. Sig.: A tablespoonful twice a day. A similar combination is serviceable in *hæmoptysis:* ℞ Plumbi acetat., ↄ ij; pulv. digitalis, ↄ j; pulv. opii, grs. x. M. Ft. pil. no. xx. Sig.: One every four hours.

By virtue of its astringent action acetate of lead restrains secretion, and hence its utility in *bronchorrhœa*. It is also serviceable in *humid asthma* and *whooping-cough*.

Formerly acetate of lead was used to quiet the action of the heart in *hypertrophy*, and to favor coagulation of the blood in the case of *internal aneurism*. It might often be usefully employed in these affections now.

In prescribing the preparations of lead for internal use, the danger of producing *plumbism* should not be overlooked. When it is used for any considerable period, the gums should be frequently inspected, and on the slightest appearance of a blue line, or on the occurrence of constipation and abdominal pain, the remedy should be at once discontinued.

External Application of Lead Preparations.—The uses of lead preparations for external diseases are numerous and important. An excellent application to *burns* is white-lead paint—carbonate of lead and linseed-oil. This may be objectionable when the surface is very large, lest a dangerous amount of absorption take place, but for burns of small extent it is safe and gives great relief. The surface of the burn is thickly coated with the paint. Lead-lotion (*liquor plumbi subacetatis dilutus*) is a good application to *eczema* when there is much weeping. The following ointment has been recommended in this affection: ℞ Plumbi acetat., ℥ ss; camphor. pulv., grs. xv; ol. amygdal., ℥ ij; ceræ flavæ, ℥ j. M. Ft. cerat. An excellent formula for *eczema*, when there are great heat and redness, and profuse discharge, consists of liquor plumbi subacetatis, ℥ j; glycerinæ, ℥ ss; and cherry-laurel water, ℥ iijss. The following formula is recommended by Fox in *eczema and lichen:* ℞ Acid. nitrici dil., ʒ ss; plumbi acetat., grs. v; aquæ, ℥ vj. M. In *erythema* the carbonate of lead is used with advantage: ℞ Plumbi carb., grs. iv; glycerinæ, ʒ j; cerat. simplicis, ℥ j. M. In *impetigo* the following: ℞ Plumbi acetat., grs. xv; acid. hydrocyan. dil., ♏ xx; alcoholis, ℥ ss; aquæ, ℥ vss. M.

Lead lotions are much used to cure *muco-purulent and purulent discharges from the ear, the vagina, and the urethra.* They may be employed at any stage, and the existence of inflammation does not contraindicate their use. The following is a useful formula for *gonorrhœa:* ℞ Liq. plumbi subacetat. dil., ℥ iv; zinci sulphat., grs. viij. M. Sig.: *As an injection.* A chemical change, of course, takes place, but clinical experience is in favor of the combination.

The ointment of the iodide of lead is often a useful application to *enlarged lymphatic glands* and to *enlarged spleen*. It is also employed with benefit in cases of *chronic eczema, porrigo,* and *psoriasis.*

A solution of the nitrate of lead in pure glycerin (grs. x— ℥ j) is an effective application to *fissured nipples.* It need hardly be remarked that the nipple should be well washed before the child is permitted to suck. Nitrate of lead in form of powder, dusted over the unhealthy granulations, gives great relief, and hastens the healing of *onychia.*

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Zincum.—Zinc. *Zinc*, Fr.; *Zink*, Ger.

Zinci Oxidum.—Oxide of zinc. A yellowish-white powder, insoluble in water, but soluble in dilute sulphuric and muriatic acids without effervescence. The solutions, when neutral, yield white precipitates with ferrocyanide of potassium and hydrosulphate of ammonium. Dose, gr. ss—grs. v.

Zinci Carbonas Precipitatus.—Precipitated carbonate of zinc. A light, white powder, odorless and tasteless, and insoluble in water or alcohol.

Ceratum Zinci Carbonatis.—Cerate of carbonate of zinc. (Not official.) (Carbonate, ℥ ij; ointment, ℥ x.)

Zinci Sulphas.—Sulphate of zinc. In colorless crystals, which effloresce on exposure to air. It is soluble in water, and the solution affords white precipitates with ammonia, chloride of barium, ferrocyanide of potassium, and hydrosulphate of ammonium. The precipitate thrown down by ammonia is wholly soluble in an excess of the alkali. Dose, gr. ¼—grs. vj.

Zinci Acetas.—Acetate of zinc. In micaceous crystals, which effloresce in a dry atmosphere. It is soluble in 3 parts of water, and its solution yields white precipitates with ferrocyanide of potassium and hydrosulphate of ammonium. The salt is decomposed by sulphuric acid, with the escape of acetous vapors. Dose. gr. ss—grs. ij.

Liquor Zinci Chloridi.—Solution of chloride of zinc. An aqueous solution, containing about 50 per cent of the salt.

Zinci Chloridum.—Chloride of zinc. A white deliquescent salt, wholly soluble in water, alcohol, and ether. Its aqueous solution yields with nitrate of silver a white precipitate, insoluble in nitric acid. (These preparations are for external use only.)

Zinci Valerianas.—Valerianate of zinc. A white anhydrous salt, in the form of pearly scales, having a faint odor of valerianic acid, and a metallic styptic taste. It dissolves in one hundred parts of water, and in forty of alcohol of the specific gravity of 0·833. Dose, gr. ¼—gr. j.

Unguentum Zinci Oxidi.—Ointment of oxide of zinc. (Oxide of zinc, 20 parts; benzoinated lard, 80 parts.)

Antagonists and Incompatibles.—Lime-water, the alkalies and their carbonates, nitrate of silver, and the vegetable astringents, are incompatible with zinc-salts. The acetate of lead is also incompatible, but a solution containing sulphate of zinc and acetate of lead, notwithstanding the double decomposition which ensues, is an effective

injection in gonorrhœa. With valerianate of zinc, acids, many of the metallic salts, soluble carbonates, and vegetable astringents, are incompatible. The antidotes to be used in cases of poisoning by the zinc-salts are lime-water, mucilaginous drinks, milk, tannic acid, the carbonated alkalies, common soap, etc.

Synergists.—The mercurial, silver, antimonial, and copper preparations favor the action of the zinc-salts.

Physiological Actions.—The preparations of zinc are active in proportion to their solubility and power of diffusion. The chloride, the sulphate, and the acetate, are the most active, and in the order in which they are placed; the carbonate and the oxide being insoluble, have very feeble diffusive power, and possess consequently very slight activity. The chloride is a very active escharotic. Applied to the denuded integument, it sets up decided inflammation, and produces an intense burning pain, followed by sloughing. Owing to its great affinity for water and power of combination with albumen, it penetrates deeply and widely, and the eschar which it produces is thick, hard, and white. The dried sulphate of zinc (deprived of its water of crystallization by heat) is also feebly escharotic when applied to an open wound. Solutions of the sulphate and acetate act locally as *astringents* by combining with albumen.

The soluble salts of zinc have a styptic metallic taste, which is very disagreeable. The sulphate of zinc is a very prompt and efficient emetic, acting without much preliminary nausea, and without much constitutional depression. It is a *specific emetic;* it acts to produce emesis when injected into the veins. Long-continued use of the sulphate, even in small medicinal doses, may excite ulceration of the mucous membrane. The oxide and carbonate, although insoluble and inactive, slowly produce systemic effects. The chloride is a powerful irritant poison, causing heat and a sense of constriction of the throat, a strong metallic taste, burning at the stomach, nausea, vomiting, great depression of the pulse, coldness of the surface, cold sweat, cramps of the legs, etc. The mind is unaffected. In a few instances nervous symptoms have followed, besides the cramps, and in one notable case there was loss of the senses of taste and smell.

All of the salts of zinc, when long continued, may produce a train of symptoms not unlike those caused by lead, viz., emaciation, pallor, loss of strength, constipation and colic, muscular weakness and trembling, paralysis, etc. The oxide in large doses, and used for a long period, has produced wasting, a fetid breath, gastro-intestinal catarrh, weakness, and feeble mind.

The zinc-salts most probably exist in the blood in the form of albuminate, and in close relation to the red blood-globules. They manifest much less tendency to accumulate, and are excreted much more rapidly than mercury, lead, and copper. They diffuse out of the blood