

Phosphorus has lately been employed as a substitute for arsenic in the skin-diseases for which the latter is used—notably *acne*, *psoriasis*, *lupus*. The author has seen excellent results from the use of the compound sirup of the hypophosphites in *acne indurata*.

Authorities referred to in this article :

- ALTER, W. *Experimentelle Beiträge über die Ursachen des Icterus bei Phosphorvergiftungen*. Diss. Breslau. V. u. H., vol. i, 1867.
- ANDANT, DR. P. E. *Bull. Gén. de Thérap.*, tome lxxv, p. 269. *Ibid.*, tome lxxvi, p. 273.
- ANSTIE, DR. F. E. *Neuralgia and its Counterfeits*, London, 1871.
- BAMBERGER, H. VON. *Wurzl. med. Ztschr.*, Band 7, 1. Full abstract in *Virchow u. Hirsch's Jahresbericht* for 1867, vol. i.
- BENNETT, DR. JAMES RISDON. *The Medical Times and Gazette*, vol. i, 1861, p. 438.
- BERNHARDT, M. *Die Veränderungen des Magens nach Phosphorvergiftung*. *Virchow's Archiv*, Band 39, p. 23.
- BERTHOLD, A. *Archiv der Heilkunde*, 1876, p. 258.
- BRADLEY, G. M. *The British Medical Journal*, October, 1872.
- BROADBENT, DR. W. H. *The Practitioner*, April, 1873, p. 230.
- DUSART, M. *The Lancet*, vol. ii, 1870, p. 122.
- EBSTEIN, DR. *Archiv der Heilkunde*. Quoted in *Schmidt's Jahrbücher*, vol. cxiv, p. 283.
- EULENBURG AND LANDOIS. *Die Transfusion bei acuten Phosphorvergift.* *Centralblatt f. d. med. Wiss.* *Virchow u. Hirsch's Jahresbericht*, 1867, vol. i.
- HARTMANN, JUL. *Zur acuten Phosphorvergift.* *Diss. Dorpat.* *Ibid.*, vol. i, 1867.
- HUSEMANN, TH. AND W. MARMÉ. *Ibid.*, vol. i, 1866.
- KÖHLER, H. *Berlin. klin. Wochen.*, i, 1870, p. 5. *Ibid.*, *Wiener Presse*, various numbers, 1873.
- LABOULBENE, DR. *Gaz. des Hôpitaux*, xlv, 1879, p. 361, and *Gaz. Hebdom.*, 1874, xxxiii, p. 524.
- LECORCHÉ, DR. *Archives de Physiologie Norm. et Path.*, tome ii, 1869.
- LEBERT, H. AND WYSS, O. *Études cliniques et expérimentales sur l'empoisonnement aigu par le phosphor.* *Archives Général de Médecine*, September, October, November, and December, 1868.
- MUNK UND LEYDEN. *Die acute Phosphorvergiftung*, Berlin, 1865. A. Hirschwald.
- PERSONNE, M. *Bulletin Général de Thérapeutique*, tome lxxvi, p. 353.
- RADCLIFFE, DR. C. B. *The British Medical Journal*, 1863, p. 489.
- RANVIER, DR. L. *Gaz. Méd. de Paris*, 27, 28, 1867. *Recherches expérimentales au sujet de l'action du phosphor sur les tissus vivants*, etc.
- ROMMELAERE, DR. *Du Traitement de l'empoisonnement par le phosphore.* *Bull. Gén. de Thérap.*, vol. lxxxii, p. 145.
- SENFTLEBEN, DR. *Virchow's Archiv*, vol. xxxvi, p. 530.
- SCHRAUBE, DR. OTTO. *Uebersicht neuer Mittheilungen über acute Phosphorvergiftung.* *Schmidt's Jahrbücher*, Band 136, p. 207.
- SORBETS, DR. *Bull. Gén. de Thérap.*, vol. lxxvii, p. 42.
- THOMPSON, J. ASHBURTON. *The Practitioner*, vol. ii, p. 13.
- VETTER, DR. A. *Ueber die acute Phosphorvergiftung und deren Behandlung.* *Virchow's Archiv*, Band 53, p. 168.
- VIRCHOW, R. *Der Zustand des Magens bei Phosphorvergiftung.* *Virchow's Archiv*, Band 31, p. 399.
- WEGNER, DR. GEORG. *Der Einfluss des Phosphors auf den Organismus.* *Ibid.*, Band 55, p. 11.

WOLFE, JEAN. *Diss. Berolini*. Full Abstract in *Virchow u. Hirsch's Jahresbericht*, vol. i, 1868. An Account of the Morbid Appearances in Sixteen Cases of Phosphorus-Poisoning, occurring in Berlin from 1861 to 1868.

PHOSPHITES AND PHOSPHATES.

PREPARATIONS.—*Syrupus Calcii Lacto-phosphatis*.—Sirup of the lacto-phosphate of lime. Dose, a teaspoonful. Lactic acid has the property of dissolving freshly-precipitated phosphate of lime.

Compound Sirup of the Phosphates (not official).—Parrish's chemical food. Each drachm contains two and a half grains of phosphate of iron and one grain of phosphate of lime.

Syrupus Hypophosphitum.—Sirup of the hypophosphites. Composed of hypophosphites of calcium, sodium, and potassium. Dose, a teaspoonful three times a day.

Syrupus Hypophosphitum cum Ferro.—Sirup of the hypophosphites with lactate of iron. Dose, a teaspoonful three times a day.

Sodii Phosphas.—Phosphate of sodium. "Large, colorless, transparent, monoclinic prisms, speedily efflorescing on exposure to air, odorless, having a cooling, saline, and feebly alkaline taste, and a slightly alkaline reaction. Soluble in six parts of water at 60° Fahr., and in two parts of boiling water." Dose, one drachm to one ounce.

Sodii Pyrophosphas.—Pyrophosphate of sodium. "Colorless, translucent, monoclinic prisms, permanent in the air, odorless, having a cooling, saline taste, and a slightly alkaline reaction. Soluble in 12 parts of water at 60° Fahr., and in 1·1 boiling water; insoluble in alcohol." Dose, half a drachm to half an ounce.

Calcii Hypophosphis.—Hypophosphite of calcium. "Colorless or white six-sided prisms, or thin, flexible scales, of a pearly luster, permanent in dry air, odorless, having a nauseous, bitter taste and a neutral reaction. Soluble in 6·8 parts of water at 60° Fahr., and in six parts of boiling water." Dose, gr. ij—gr. x.

Calcii Phosphas Præcipitatus.—Precipitated phosphate of lime. "A light, white, amorphous powder, permanent in the air, odorless, tasteless, and insoluble in water or alcohol." Dose, gr. ij—gr. v.

Sodii Hypophosphis.—Hypophosphite of sodium. Small, colorless or white, rectangular prisms, or a white granular powder, having a sweetish, saline taste and a neutral reaction. Soluble in one part of water. Dose, gr. v—gr. x.

PHYSIOLOGICAL ACTIONS.—In the first edition of this work the phosphates were included in the same section with phosphorus. There is a strong argument in favor of this arrangement, based on the chemical reactions which ensue when phosphorus is introduced into the stomach. Phosphorus has a strong affinity for oxygen, and compounds are quickly formed in the stomach. It is probable, however, that some phosphorus enters the blood uncombined. It is certain that the effects

of phosphorus differ in character from the effects of any of its compounds. They agree in the property of aiding constructive metamorphosis, but differ widely in other respects.

PHYSIOLOGICAL ACTIONS OF PHOSPHATE OF LIME.—There is no part of the body which does not contain, or does not yield on incineration, phosphate of lime. It gives solidity to the osseous framework of the body, and, when too little is furnished during the growing period, rickets and *mollities ossium* are the result. The demand made on the system of the mother for the supply of this essential material for the growth of the osseous structure of the fœtus is so great that her fractured bones unite with difficulty. The bones of animals, fed on food deficient in phosphate of lime, soften. All the animal fluids contain this substance in solution: thus it is found in the blood, the saliva, the gastric juice, milk, urine, and in the intercellular fluid throughout the body. It accumulates wherever tissue-changes are rapidly taking place (Dusart). It is obviously very important to the nutritive processes of the body.

As phosphate of lime is to a limited extent soluble in lactic and hydrochloric acids, it is evident that, administered by the stomach, diffusion into the blood must occur. Large amounts can not, however, be disposed of in this way; hence small doses must be as effective, in the treatment of the maladies for which it is prescribed, as large ones—for all in excess of the quantity soluble in the free acids of the stomach must pass off with the fœces or form intestinal concretions.

PHYSIOLOGICAL ACTIONS OF PHOSPHATE OF SODIUM.—This salt is soluble in water in the proportion of four per cent. Hence it may be given in solution, and will readily diffuse through into the blood. In the dose of one ounce it acts as a laxative. As it has a saline taste similar to common salt, it may be given in soup or other food. It increases the alkalinity of the blood, according to Böcker, by causing a retention of the chloride of sodium. Phosphate of soda diminishes the excretion of urea, in part, it is supposed, by hindering the retrograde metamorphosis of tissue, in part by its interference with the process of digestion. It is a constituent of the blood in the normal state, and as it possesses the remarkable property of increasing the quantity of carbonic acid which can be held in solution by any liquid, obviously we have in these facts an explanation of its influence over the excretion of urea. That it impairs digestion in large doses when administered in health may be admitted, but by removing morbid states of the mucous membrane the digestive function, in suitable cases, is directly promoted by its use, and the nutrition of the body generally, and the tone of the nervous system, improved.

Therapy.—In cases of the so-called *bilious sick-headache*, phosphate of soda is a most useful laxative. A permanent cure of this very troublesome malady may be wrought by regulation of the diet, and by

the long-continued use of this remedy. It is not pretended that cases of *migraine*, due to an affection of the nucleus of the fifth, may be thus cured. A large proportion of these cases are produced by a catarrhal state of the gastro-intestinal mucous membrane, which the phosphate of soda has the power to remove. For the same reason, it is a remedy of the highest utility in cases of *jaundice* dependent on catarrh of the bile-ducts, this disease being secondary to the same process in the intestinal mucous membrane. In these affections the phosphate of soda should be administered in a drachm dose (about one teaspoonful) three times a day, or more frequently. Children, who are frequently subjects of this disorder, do not require larger doses than ten grains to a scruple. In preventing inspissation of the bile and crystallization of cholesterin, and attacks of *hepatic colic*, the persistent use of the phosphate of soda is rarely unsuccessful. It is not pretended that this agent can relieve the attacks of hepatic colic, and, indeed, it is useless at these times. Many cases of this disease, if not most of them, originate in a catarrh of the duodenum, the transference of the catarrhal state by continuity of tissue to the gall-bladder, and the formation of a nucleus of mucus and bile, about which the cholesterin crystallizes. Phosphate of soda has the property to prevent the occurrence of these changes, and consequently to prevent attacks of hepatic colic. The author has found one scruple to drachm doses, administered for several months before each meal, extremely efficacious in a number of cases of this kind. The value of Vichy in this and kindred affections probably depends on the phosphate of soda contained in this mineral water.

Many *ill-conditioned children* are found to pass *pasty and white stools*, showing the absence of bile, and are pale and ill-nourished notwithstanding an abundant supply of milk and a vigorous appetite. Ten grains of phosphate of soda, dissolved in the milk and given them several times each day, will often improve the intestinal digestion, change the appearance of the stools, and increase the nutrition of the body.

The phosphates are especially useful in diseases characterized by *mal-nutrition*. In *rickets*, *mollities ossium*, *delayed union of fractures*, *early decay of the teeth in children*, *caries and necrosis of bone*, in which the phosphate is needed to the repair and growth of the osseous structures, it may be supplied artificially. The phosphate of lime may be administered alone in these states, but is to be preferred in the form of the sirup of the lacto-phosphate, or of Parrish's phosphates. As a large consumption of the phosphate of lime takes place during suckling, the *anæmia of the nursing mother* may be most advantageously treated with the lacto-phosphate of lime or phosphates. The waste caused by *suppuration*, *carbuncles*, *mammary abscesses* or *boils*, may be best repaired by the same means. The constitutional

cachexia produced by *chronic bronchitis* with profuse expectoration, *leucorrhœa*, and similar exhausting discharges, may be much improved by the phosphates, and with the general improvement of the bodily state there usually takes place an arrest of the local morbid process.

The explanation of the therapeutical action of the phosphates in the diseases just mentioned is equally true of their use in *phthisis*. The utility of the *hypophosphites* in this disease is not any greater, for it is probably true that these preparations undergo oxidation in the stomach and pass to phosphates. The compound sirup of the hypophosphites is an agreeable preparation and is readily taken, and certainly proves serviceable in the more chronic forms of the disease. The lacto-phosphate, the phosphates, and the hypophosphites, are undoubtedly useful in *chronic phthisis*, *fibroid lung*, *chronic tuberculosis*, *emphysema*, and *dilated bronchi*, but no advantage can be expected from them in acute tuberculosis and caseous pneumonia. The utility of these preparations in these groups of maladies depends on their power to promote constructive metamorphosis. If they improve the appetite, promote digestion, and increase the body-weight, they do good; if they disagree with the stomach, they do harm (Bennett). Not unfrequently the sirup of the hypophosphites gives rise to distressing tormina. This may be obviated by combining with it dilute phosphoric acid—a combination very effective, therapeutically: ℞ Syrp. hypophos. comp., \bar{z} iijss; acid. phosphor. dil., \bar{z} ss. M. S.: A teaspoonful three times a day. Such a combination may be advantageously given with cod-liver oil, after meals, in chronic phthisis. The addition of arsenic contributes very materially to the therapeutical effects of the lacto-phosphate; for example: ℞ Syrp. calcii lacto-phos., \bar{z} iv; liq. potassii arsen., 3 j. M. S.: A dessert-spoonful *ter die*.

Late favorable reports regarding the curative effects of phosphorus and its compounds in *pernicious anæmia* have not been confirmed by the most recent experience.

Percy, who has distinguished himself by researches on phosphorus, prepares hypophosphorous acid by passing through a solution of phosphorus in oil, perfectly pure and dry oxygen. He maintains that hypophosphorous acid is the only preparation of phosphorus which should be employed in medicine.

Further experience with the phosphate of soda justifies the author in the expression of his belief that it has the power to retard the growth of the changes known as *sclerosis of the liver*, and possibly, under favorable circumstances, to arrest them and to restore a comparatively normal functional state. When, in obese subjects, a *succession of boils* portends the development of diabetes, this remedy is highly useful. It has seemed very beneficial in the hepatic form of *diabetes*. No remedy is more effective in removing that condition of the system which produces *furuncles*, or *boils*.

IRON AND ITS PREPARATIONS.

Ferrum.—*Fer*, Fr.; *Eisen*, Ger. “In the form of fine, bright, non-elastic wire.”

Ferrum Reductum.—Reduced iron. *Ferri pulvis*. A tasteless powder of an iron-gray color. Dose, gr. ss—gr. ij.

Ferri Carbonas Saccharatus.—Saccharated carbonate of iron. A greenish-gray powder, odorless, having at first a sweetish, afterward a slightly ferruginous taste. It is only partially soluble in water. Dose, gr. ij.

Trochisci Ferri.—Troches of hydrated oxide of iron. Composition: Hydrated oxide of iron, vanilla, sugar, and mucilage of tragacanth. Dose, one to five.

Ferri Oxidum Hydratum.—Hydrated oxide of iron. Kept in the form of a soft magma and used as an antidote to arsenic.

Ferri Oxidum Hydratum cum Magnesia.—Hydrated oxide of iron with magnesia. (For arsenical poisoning.)

Pilule Ferri Compositæ.—Compound pills of iron. Composition: Myrrh, carbonate of sodium, sulphate of iron. Dose, one or two pills.

Massa Ferri Carbonatis.—Mass of carbonate of iron (Vallet's mass). Sulphate of iron, carbonate of sodium, honey, sugar, etc. Dose, gr. iij—gr. v.

Mistura Ferri Composita.—Compound mixture of iron. Composition: Myrrh, sugar, carbonate of potassium, sulphate of iron, spirit of lavender, rose-water. Dose, a tablespoonful.

Emplastrum Ferri.—Iron-plaster, strengthening-plaster. Composition: Subcarbonate of iron, lead-plaster, and Burgundy pitch.

Ferri Hypophosphis.—Hypophosphite of iron. A white or grayish-white powder, odorless and nearly tasteless, only slightly soluble in water.

Ferri Phosphas.—Phosphate of iron. A bright, slate-colored powder, insoluble in water. Dose, gr. ij—gr. v.

Ferri Pyrophosphas.—Pyrophosphate of iron. In apple-green scales, having an acidulous, slightly saline taste, and wholly soluble in water. Dose, gr. ij—gr. v.

Ferri Sulphas.—Sulphate of iron. In transparent, bluish-green crystals, which, on exposure to the air, effloresce and change color. Is wholly soluble in water. Dose, gr. j—ij.

Ferri Sulphas Exsiccata.—Dried sulphate of iron. A grayish-white powder, soluble in water with the exception of a small residue. Dose, gr. j—gr. ij.

Ferri Sulphas Præcipitatus.—Precipitated sulphate of iron. A pale, bluish-green powder; oxidizes in contact with moisture; soluble in 1.8 part of water at 60° Fahr. Dose, gr. ij—gr. v.

Liquor Ferri Subsulphatis.—Solution of subsulphate of iron. Mon-