ON PHENIC ACID.

ITS ACTION ON VEGETABLES, ANIMALS, FERMENTS, POISONS, VIRUS, MIASMAS,
AND ITS APPLICATIONS TO HYGIENE, TO THERAPEUTICS, AND TO
THE ANATOMICAL AND INDUSTRIAL SCIENCES.

By M. LE DOCTEUR JULES LEMAIRE.

As the subject treated of in these papers is of considerable practical importance, we shall present our readers with a short abstract of them.

Phenic acid ($C_{12}H_5O,HO$) was discovered in 1834 by Runge, who has given it the name of carbolic acid. Laurent, who studied this body, and described many of its combinations, designates it under the name of phenic and hydrate of phenyle, because he objects to place it among the acids. Gerhardt gave it the name of phenol. It has also received the names of phenic alcohol, of spyrol, and of salicone. [In this country the acid is best known in trade as carbolic acid.]

It has been formed synthetically by M. Bertholot, by passing alcoholic or acetic acid vapors through a porcelain tube heated to redness. The acid is also obtained in the dry distillation of benzoin, quinic acid, the resin of xanthorrea hastilis, castoreum, and chromate of pelosine. Gerhardt has obtained it from salicylic acid by the action of lime or baryta. Stædeler has found that the urine of man, the horse and cow contain it in quantities easily perceivable. It exists also in commercial creasote; but it is from the oil from gas tar, which contains it in considerable quantity, that it is obtained.

Preparation.—The oil from coal tar is submitted to fractional distillation. The part which passes over between 160° and 190° is treated with a solution of hot saturated caustic potash and some powdered potash. A mass of crystals is thus obtained, which may be separated by decantation of the fluid.

“When this mass is dissolved in water the solution separates into two layers, one light and oily, the other heavy and watery. The latter is separated and treated with hydrochloric acid, which sets free the carbolic acid. To obtain it pure, it must be digested with fused chloride of calcium and re-distilled once or twice. After several rectifications, and by cooling slowly, it can be obtained in a solid colorless crystalline mass.

The pure acid has an odor resembling creasote; the specific gravity = 1.065. It burns with a reddish flame; boils between 187° and 188° . It does not redden litmus, only making an oily stain on the paper. It is soluble to some extent in water, but is very soluble in alcohol, ether, and acetic acid, as well as in glycerine and the fixed and volatile oils.

The pure acid acts energetically on the skin. A weak aqueous solution coagulates albumen and the blood, and acts as a strong

The Boston Medical and Surgical Journal as published by

antiseptic. Putrid meat and fish, fæcal matters and fermented urine instantly lose their disgusting odor, when immersed in or treated with the solution.

Chemically, phenic acid is a weak acid. It combines with metallic oxides, but the salts have little stability; carbonic acid decomposes them. Those with an alkaline base have always an alkaline reaction.

In consequence of the supposed little solubility of carbolic acid in water, it has hitherto been chiefly employed mixed with powders, as in the case of Smith and McDougall's disinfecting powder; but the author of these papers has by careful experiments determined that the pure acid is sufficiently soluble in water for the solution to possess the power of coagulating albumen, of arresting or preventing spontaneous fermentation, and consequently of destroying infection. The saturated solution acts also on plants and the lower animals as a violent poison, though containing but five per cent. of the acid. The solubility of the acid may be considerably increased by the addition of from five to ten per cent. of alcohol or of acetic acid.

From the experiments which the author has made on the action of phenic acid on plants and animals, it appears that a very weak solution will instantly destroy the lowest forms of animal and vegetable life. The juices of vegetables are prevented from becoming mouldy by the addition of the smallest quantity of the acid. Herbs and shrubs watered by a stronger solution rapidly die.

The microscopic beings concerned in the production of putrefactive fermentation are as quickly destroyed by a weak solution, and the putrefaction is completely arrested. Parasitic and earth-worms also are easily killed by a solution containing one half per cent., or by exposure to air containing but a small proportion of the acid. An injection of water containing one half per cent of the acid brought away from a child a large quantity of *ascarides lumbricoides*, all dead. A stronger solution kills the eggs of ants and carwigs, and larvæ of butterflies, caterpillars, &c.

The author has studied the action of the acid on the mammalia with mice, guinea-pigs, dogs and horses, as well as men.

Action on the Human Skin.—Immediately after the application of a thin coating of the pure acid, a sharp smarting is felt, which lasts about an hour. The epidermis becomes wrinkled, and in a short time the formation of a white body may be remarked wherever the acid has touched. This white coloration results from the action of the acid on albumen; it disappears by degrees, and is replaced by some congestion, which lasts about twenty days. This congestion presents all the characters of an intense inflammation, being attended with redness, heat, and swelling. If a small piece of the epidermis (which appears raised as in a blister) be stripped off, no serum escapes. The epidermis becomes detached by degrees, and

when the exfoliation is complete a brown spot remains, which testifies for a long time to the energetic action of the acid. After a number of experiments on his own arms, and the arms of his friends, M. Lemaire assures us that the smarting never lasts longer than an hour. The redness of the skin endures about twenty days, but the inflammation never extends beyond the part to which the acid has been applied.

Action on the Mucous Membrane.—The action of the pure acid on the mucous membrane is, of course, analogous to its action on the skin; acute smarting, shrivelling up of the epithelium, and a milky coloration being observed. The smarting does not last so long as on the skin, especially on such membranes as produce an abundant secretion; and the epithelium quickly returns to its normal condition.

Action on the Respiratory Organs.—From experiments on mice and horses, the author concludes that the higher animals may breathe the diluted vapor of the acid for a long time without discomfort or danger.

Mode of Action.—The general fact resulting from the author's experiments is that phenic acid acts on plants and lower animals as a violent poison.

When the action of the acid on a semi-transparent leaf is examined, it is easy to prove that it coagulates albumen, and that the parenchyma and epiderm are contracted. This explains how it is that microphytes and microzoons die so quickly in its presence. All animals with a naked skin, and those which live in the water, die sooner than those which live in the air and have a solid envelope. The difference appears to result from the power of absorption, which is much greater in the former than the latter.

When frogs are placed in a saturated solution (5 per cent.) of the acid, the skin shrivels and becomes milky from the coagulation of the albumen. The branchiæ of fishes also become white. This coagulation of albumen led the author to suppose that the death of the animals resulted from the coagulation of their blood. To verify this supposition, he examined, under the microscope, the action of the acid on the branchiæ of the larvæ of salamanders, in which the circulation of the blood is easily seen. He then observed that, although the solution arrested the circulation instantaneously, it altered neither the form nor appearance of the blood globules. All the change consisted in their immobility. When the blood is coagulated by mineral acids the form of the globules is changed. With carbonic acid nothing of the kind takes place. Besides this, a post-mortem examination of a dog and horse proved that the blood was not coagulated. Phenic acid, then, does not kill by producing coagulation of the blood! Its action on the blood globules, however, leads M. Lemaire to think that these globules are living beings.

Insects exposed to a weak dose of the acid become asphyxiated, but they soon recover in pure air.

When a gramme or two dissolved in water are administered to a dog, the animal falls as if struck with lightning, but soon recovers again. The sudden fall the author ascribes to violent pain, and the rapidity with which it is absorbed and carried to the nervous centres. It is on the nervous system, then, that phenic acid principally acts.—*Chemical News.*

Bibliographical Notices.

The Physician's Handbook of Practice for 1864. By WILLIAM ELMER, M.D. New York: W. A. Townsend, publisher.

WE have carried this Visiting List for several years, and have found it in many respects better adapted to the wants of the practitioner than any other we have seen. The list of remedial agents, combining as it does in a compact form nearly all the preparations ever employed in medicine, is particularly valuable, affording to its bearer opportune information concerning the dose of any drug he may wish to prescribe, which may have escaped his memory. We are pleased to see that there has been added in this edition an index of the common names of the articles of the materia medica, for in previous years certain important agents have been arranged according to their little used generic names, so that one wishing to refer to ipecac. or belladonna, for instance, might think they were omitted unless it had occurred to him to look for cephaelis and atropa. We cannot help thinking, however, that the list of agents given, which amounts to 689, and bears too close a resemblance to the materia medica of some botanical doctor, might be reduced with advantage one half at least in number. What is wanted in a pocket-book is simply what is well known, not matter to be tested by experiment.

With the exception of the substitution of another "ready method" in asphyxia for that of Marshall Hall, the contents of the volume remain the same as in former years. We heartily recommend it to every practising physician.

THE BOSTON MEDICAL AND SURGICAL JOURNAL.

BOSTON: THURSDAY, DECEMBER 3, 1863.

MENTAL HYGIENE.*—"Canst thou not minister to a mind diseased?" is a question which sooner or later is sure to be addressed to every physician of extended experience; and it is a matter of sincere satisfaction that through the unwearied and philanthropic efforts of the students of mental disorder at the present day he is enabled to give so often a much more encouraging reply than that which pro-

* *Mental Hygiene.* By F. Ray, M.D. Boston: Ticknor & Fields, 1863.