of other specific organisms, affecting the human body or that of animals, it would seem reasonable to hope and expect that further research may furnish an efficient remedy in the form of an antitoxin in anthrax, such as has been obtained in respect to some other of the bacterial infections, particularly human diphtheria.*

The discovery of such an antitoxin has not, however, been announced; and the treatment of anthrax must still be considered as largely empirical or entirely symptomatic. This will vary according to the seat of the primary lesion, the severity and rapidity of the development of the disease, the possibility of employing efficient remedies locally, and many other circumstances which will arise in each individual case.

The treatment of the conditions following the immediate effects of anthrax, such as inflammatory and suppurative affections of the lungs or of other organs, should be directed by the considerations and principles applicable to the treatment of similar conditions arising from other causes.

The only practicable prophylactic measures which are adapted for general use among those subject to domestic visitations of anthrax, are to prohibit the use of any product or part of diseased animals; to protect the bodies of infected animals from flies and other insects, and to bury them as early as possible deeply in the earth, or preferably to burn them. Care should also be taken that none of the fluids or secretions of diseased or dead animals be allowed to soil the stables or yards where they have been confined, nor to cling to implements, such as shovels, etc. The feces, being loaded with bacilli, should be carefully collected and buried. All stalls and stables visited or occupied by diseased animals should be carefully disinfected and whitewashed. Other suitable precautions which may be applicable to individual cases should be rigorously carried out, as the best safeguard against the spread of the disease among human beings is to control it among the lower animals. The precautions to be observed in relation to infected articles of commerce—hides, hairs, wool, rags, etc.—have been mentioned in an earlier part of this article.

Albert N. Blodgett.

The literature upon the subject of anthrax is very large, but among the most valuable contributions may be mentioned:

Heusinger: Die Milzbrandkrankheiten der Thiere u. des Menschen, Erlangen, 1850.
Bollinger: Art. Milzbrand in v. Ziemssen's Handbuch.
Waldeyer: Virchow's Arch., Bd. lii., S. 541.
Zuelzer: Berl. klin. Wochenschrift, 1874, No. 25; also in Eulenburg's Realencyclopädie, vol. ii., p. 679.
Quain: Dictionary of Medicine, p. 1302.
Forbes: International Encyclopædia of Surgery, vol. i., p. 228.
Holmes' System of Surgery, vol. v., p. 467.
John Henry Bell, in Allbutt's System of Medicine (contains a valuable list of references). Traité de Médecine. Charcot, Buchard, Brissaud, vol. i., p. 523.
Fagge: Principles of Practice of Medicine, vol. i., p. 367.
Twentieth Century Practice of Medicine, vol. xv., art. Anthrax.

ANTHROPOMETRY. See *Recruiting Service* and *Skull*.

ANTIARTHRIN is a condensation product of tannic acid and saligenin, one of the decomposition products of salicin. It has been found by Schaeffer to be of value in acute and chronic gout and acute rheumatism, it possessing the advantages of not deranging the stomach and not depressing the heart. The compound is very unstable, and, to prevent decomposition, it must be kept dry and free from admixture with other drugs. Dose: fifteen grains, from three to six times a day. *W. A. Bastedo.*

ANTIDIABETINUM.—Glycosolveol. A name applied to a series of three mixtures of mannite and saccharin, each mixture having a definite sweetness in proportion to that of cane sugar. Antidiabetinum No. 1 has the same sweetening power, No. 2 is ten times as sweet, and No. 3 is seventy times as sweet as sugar. They are used as substitutes for sugar in diabetes. *W. A. Bastedo.*

ANTIDOTES.—(Deriv., ἀντι and δίδωμι.) Antidotes are remedies which, acting mechanically, chemically, or physiologically, are capable of combating and neutralizing the effects of poisons on the system. They may be divided into three classes, according to their mode of action: (1) mechanical, (2) chemical, and (3) physiological or dynamic.

1. Mechanical Antidotes.—The functions of this class are the removal of poisons as such from the system and the mechanical prevention of absorption. In this class are included emetics, stomach tube, cathartics, injections, washes, poultices, ligature, tourniquet, etc.

The use of *emetics* is frequently rendered superfluous by the vomiting induced by the poison itself or by the diluent drinks already administered. Where there exists any considerable corrosion of the œsophagus or stomach, or severe abdominal inflammation, their use is contraindicated. When employed they should be administered without delay, and vomiting should be carried on to such completeness as circumstances will allow. The nature of the poison in each particular case must to a certain extent govern the choice of the emetic to be prescribed. Thus, common salt is contraindicated in poisoning by tartar emetic or by corrosive sublimate, and oily substances in poisoning by phosphorus, cantharides, and salts of copper. The emetics include sulphate of copper, sulphate of zinc, tartar emetic, ipecac, emetin, apomorphine, soapsuds, olive oil, melted fats, snuff, etc. In most cases, vomiting may be induced, encouraged, and supported by tickling the fauces with the finger.

Sulphate of copper may be administered in doses of 0.12 to 0.30 gm. in water. Sulphate of zinc is a very efficient emetic in doses of 1.0 to 2.0 gm. in 250 gm. of water. Tartar emetic is slow in action, and it exercises so depressing an effect on the system as to render its use inadvisable when emesis can be otherwise produced. If administered it should be given in 0.1 gm. doses, once or twice repeated if necessary. Ipecac is best given in the form of powder, the action of the wine and of the fluid extract being too uncertain. The powdered root may be given in 1 to 2 gm. doses in warm water, or it it may be combined with tartar emetic in the proportion of 1 to 0.05 gm. The alkaloid emetine is an efficient emetic in doses of 0.005 to 0.020 gm. Apomorphine is in many cases the only emetic possible to introduce, especially when there is resistance or trismus. It is not only a very powerful emetic, but it acts with great rapidity. It is administered by subcutaneous injection in doses of 0.004 to 0.010 gm. The common household remedies, salt, mustard, soapsuds, etc., are frequently of great assistance, and they possess the advantage of availability. Common salt is effective when given in the proportion of two tablespoonfuls to a pint of water; mustard in doses of two teaspoonfuls in a cup of warm water; snuff, one teaspoonful in warm water or claret. Olive oil, soapsuds, etc., require no especial mention.

It frequently happens, especially in poisoning by narcotics, that even the most powerful emetics are inoperative. In such cases the *stomach pump* is a very valuable aid. This instrument has certain advantages over the emetics; the object is attained more quickly, the patient is spared the weakening effects of the emetics, and fluids may be introduced not only for washing out the stomach but for their chemical action on any residuum adherent to the stomach wall. Should the instrument be not readily obtainable, one may use a common rubber tube to one end of which a funnel is attached. To use this very excellent substitute is a matter of no great difficulty; introduce the free end into the stomach, elevate the other end, and pour water or other fluid through the funnel until the stomach and tube are full; then lower the funnel end to make a siphon, and allow the contents of the stomach to escape into a proper vessel. The employment of the stomach pump is not permissible when the œsophagus and stomach are corroded, on account of the danger of perforation. The instrument is also of no value when the poisonous substance is in the solid form and in large pieces (meat, sausage, cheese, etc.).

Cathartics are frequently necessary when the poison has passed from the stomach into the intestine. Those in most common use are castor oil, croton oil, Epsom salts, senna, etc. Castor oil not only acts as a cathartic, but protects the mucous membranes and obstructs absorption. Its use is contraindicated in phosphorus and cantharides poisoning, since the absorption of these substances is materially assisted by fats and oils. Croton oil is valuable by reason of its rapid and powerful action. It is best given in pill form (bread crumb) in doses of one to four drops. Sulphate of magnesium in doses of 4 to 16 gm. (ʒ i.–iv.) is recommended in chronic lead poisoning, and in connection with certain of the chemical antidotes as an aid in the removal of the resulting compounds from the alimentary canal. Gamboge, croton oil, and other drastics are to be preferred to the cathartics of milder action in narcotic poisoning.

The other physical antidotes above mentioned are employed according to the circumstances of particular cases. Their use is limited almost wholly to poisoned wounds and bites.

2. Chemical Antidotes.—These constitute the class of true antidotes; they act on the poisons themselves rather than against their effects, differing in this respect from the dynamic or antagonistic antidotes. Their action depends upon their property of uniting chemically with poisonous substances, thus altering their chemical and physical character, converting soluble absorbable substances into insoluble or difficultly soluble non-absorbable compounds, or, as the case may be, into compounds which are soluble and absorbable, but harmless. Their use is restricted to those cases in which the nature of the poison is known. Good chemical antidotes should be themselves harmless, even in large excess, easily obtainable, and capable of rapid action. Their employment should not be unnecessarily delayed nor too long continued. They are usually administered in large doses, since it is as a rule impossible to determine the necessary amount with any exactness, but in certain cases the amount given must be carefully regulated, on account of the solubility of the resulting compound in an excess of the antidote; instances illustrative of this point are copper salts with albumin, and the alkaloids and their salts with tannin. In all cases the new-formed compounds, especially when only temporarily insoluble, or insoluble only in the stomach, must be removed by appropriate means with all possible despatch.

The antidotes of this class are divided into (*a*) Organic, and (*b*) Inorganic.

(*a*) *Organic Chemical Antidotes.*—These antidotes are derived from the animal and vegetable kingdoms, and include substances of widely diverse character. The most important are albumin, milk, gelatin, charcoal, soap, tannin, turpentine, oils, etc.

First in importance is *albumin*, which is adapted to very general use, especially against the inorganic poisons. It is in most cases very easily obtained, it never causes of itself any harm, and it forms more or less insoluble compounds with most metallic salts and mineral acids. Orfila recommended its invariable use, even on mere suspicion of poisoning. It is best administered in fairly dilute form, the whites of four eggs to a quart of lukewarm water. When taken in sufficiently large amounts, it not only unites with the poison to form insoluble compounds, but provides a protecting coating for the mucous membrane, and at the same time may induce vomiting. With hydrochloric, nitric, and sulphuric acids it produces coagula which are more or less soluble in large amounts of water; with phosphoric, acetic, tartaric, and the organic acids generally (tannic excepted), no precipitation occurs. With the corrosive alkalies albumin forms soluble, harmless compounds when given in copious draughts. It forms insoluble albuminates with the alkaline earths and soluble compounds with potassium and sodium. The alums, tartar emetic, and compounds of arsenic are not precipitated. Iodine, bromine, and chlorine unite directly and intimately with the antidote to form harmless compounds. With phosphorus its action is very limited, and of no especial value except as a diluent drink. The presence of any large excess of alkali acts in general to prevent the precipitation of the albumin compounds. The precipitates of albumin with the salts of the heavy metals consist either of a compound of albumin with a basic salt, or, as it is claimed, of a mixture of the metallic albuminate with a compound of albumin and the acid of the metallic salt. They are usually soluble in acids and alkalies, and insoluble in excess of albumin. Notable exceptions are the compounds with mercury and copper, which are soluble in a considerable excess of the antidote. The compounds with salts of lead, copper, and zinc are easily dissolved in lactic, acetic, and other organic acids, and in free alkalies. In the case of sulphate of zinc, however, which is precipitated only in very great excess of the antidote, the precipitation is hastened, and rendered more complete, by the addition of a small amount of free alkali. Silver salts are easily precipitated; the resulting compounds are partially soluble in excess of common salt. The precipitate with corrosive sublimate is easily soluble in mineral and organic acids, common salt and similar chlorides, somewhat soluble in sodic phosphate and in large excess of albumin. The precipitates of the other mercuric salts are less soluble in the same solvents; the mercurous salts are reduced to the metallic form. Other salts with which albumin unites are those of gold, platinum, zinc, antimony (except tartar emetic), and iron. Among the organic poisons which unite chemically with albumin are creosote, aniline, and alcoholic solutions of most of the alkaloids.

In case albumin is not obtainable, recourse may be had to *milk* as a substitute; its action is due to its casein, albumin, and free alkali. Administered lukewarm it is very valuable in poisoning by metallic salts, corrosive acids and alkalies (especially ammonia), and the alkaline earths. Its richness in fat contraindicates its use where fatty substances are to be avoided.

The value of *gelatin* as an antidote to many metallic salts would be greater if less time were required for its preparation in a suitable form for administration. It must be broken up into small pieces, covered with water, and allowed to soak for about an hour; more water is then added, and the mixture is heated with constant stirring until a fluid of the consistence of honey is obtained. Its chief value is in poisoning by iodine, bromine, and the alums.

Tannin, and substances containing it, act as efficient antidotes to many of the organic and inorganic poisons. Tannin forms more or less insoluble compounds with many metallic salts, but it cannot be considered as equal to albumin in efficiency as an antidote to this class of poisons. Tartar emetic is, however, a notable exception since it is unaffected by albumin, but rendered harmless by tannin, with which it forms an almost insoluble compound. Tannin has considerable value as an antidote to the vegetable poisons; it precipitates the alkaloids and their salts, and forms compounds which are dissolved only with difficulty. These compounds are of themselves poisonous, and hence must be removed from the system as soon as possible by emetics, drastic purges, or the stomach tube. Tannin may be given in doses of 0.1 to 0.3 gm. in two-per-cent. solution every quarter of an hour. Combined with about one-tenth of its weight of iodine its effect on the vegetable poisons is very much increased. Should tannin itself be not easily obtained, decoctions of substances containing it may be substituted. Among the large number of these may be mentioned tea, coffee, oak bark, willow, cinchona bark, nutgalls, kino, rhatany, and catechu.

Sugar has been recommended in poisoning by the alkaline bases, with which it is supposed to form sucrates. It has also been recommended in poisoning by salts of copper, but just what value it possesses in

* "How far this principle will be found capable of general application in infective diseases and whether pathologists will be successful in discovering the necessary modes of attenuation and cultivation the future will show. The outlook is certainly most hopeful."—Prof. J. A. Lindsay: Lancet, December 20, 1899, p. 1799.