When discharge of pus or any fluid is expected, it is well to provide for it in the dressing. In this case a piece of protective, perforated opposite the drain outlets, may be laid over the wound, and this may be covered with such absorbent material as the operator prefers. But when no discharge is expected and it is desired to leave the dressings undisturbed till healing has occurred, it will be well to cover the wound with one or more thicknesses of gauze, and over this to apply in layers a smooth, equably distributed dressing, with some impermeable stuff outside. At all events, the dressing must be used unsparingly, and it is better to fasten it on with a bandage of starched material. Outside of all a retentive towel, neatly pinned so as snugly to fit the head, will be found very serviceable. Sometimes an ice-bag applied to the head, or an ice-cap, will be found of advantage, especially if oozing be feared. Many surgeons are fond also of administering an active purgative, which certainly is not without value in some cases. *Roswell Park.*

TRI-BENZOYL-GALLIC ACID occurs in odorless and tasteless crystals which are insoluble in water and soluble in alcohol. It is said to set free gallic acid in the intestine, and is employed as an intestinal astringent. Dose 1 gm. (gr. xv.). *W. A. Bastedo.*

TRI-BROM-PHENOL. See *Bromol.*

TRIBROMPHENOL-BISMUTH, Xeroform, $C_6H_2Br_3.O.BiO$, is a fine yellow, almost tasteless powder of slight carbolic odor. It is insoluble in water, alcohol, chloroform, and the oils, but dissolves in two-per-cent. hydrochloric acid. It is unimpaired by heat below 120° C. (248° F.), and so may be sterilized.

Reynders states that in the gastric juice this substance splits into bismuth oxide and tribromphenol. It would seem, therefore, to be a serviceable gastric and intestinal sedative and antiseptic. R. W. Wilcox recommends it especially in the fermentative diarrhœas, though Brochocki failed to obtain good results in twelve cases of tuberculous enteritis, four of acute gastro-enteritis, three of catarrhal dysentery, and three of typhoid fever. The dose is 1 gm. (gr. xv.) three times a day. It may be found in the urine for twenty-four hours after ingestion, and one of Reynders' patients showed the carbolic reaction with brown urine. In daily doses of 6–7 gm. (gr. xc.–cv.) Hueppe saw no untoward action, and 1 gm. (gr. xv.) administered to a frog, and 8 gm. (℥ ij.) to a guinea-pig produced no undesirable effect.

The chief use of the remedy, however, is as an external application. There is much clinical evidence showing it to be an antiseptic, deodorizing dusting powder of great value, stimulant to granulation, analgesic, and preventing the formation of pus. It has also been much employed in the treatment of eczema, furuncles, tuberculous ulcerations, chancroids, etc. In ophthalmic work it has been applied as a five- or ten-per-cent. ointment in conjunctivitis, eczema of eyelids, and corneal ulcers; in nasal, pharyngeal, and laryngeal catarrh, and in suppurative otitis media as an insufflation; in gynecological and venereal disease as a local application. There is also on the market a ten-per-cent. xeroform gauze, which has the advantage of being sterilizable by heat.
W. A. Bastedo.

TRI-BROM-SALOL, Cordol, $C_6H_4.OH.COO.C_6H_2Br_3$, is made by acting on salol with bromine in excess. It occurs in long white needles, which are insoluble in water and slightly soluble in chloroform or glacial acetic acid. It has been proposed as a gastric sedative and intestinal antiseptic in dose of 1–2 gm. (gr. xv.–xxx.), and is said to split in the intestine into salicylic acid and tribrom-phenol. The methyl compound of tri-brom-salol, known as "cordeine," and the acetyl compound "cordyl" are also in use. *W. A. Bastedo.*

TRICHINOSIS; TRICHINIASIS. — Although previously observed after death in the muscular tissues of human beings by others, the trichina spiralis was first fully described by Owen in 1835. In 1847 it was discovered by Leidy in the flesh of swine, and in 1849 by Guret in the cat. In 1851–52 Herbst succeeded in developing trichinosis in the dog by feeding the flesh of a trichinous badger. It remained, however, for Zenker, in 1860, to make the first clinical record of a case of trichinosis in man. The disease simulated typhoid fever, but, death resulting, post-mortem examination disclosed the presence of sexually mature parasites in the intestine and of living unencapsulated parasites in the muscles. It was further discovered that others who had partaken of some pork in company with the patient had been made ill, and on investigation this meat was found to contain trichinæ. Subsequent inquiry showed the course of events to be as follows: Human beings become infected through the use of trichinous pork. The capsules of the ingested parasites are digested in the intestine, where sexually mature trichinæ then develop. These begin to give birth to young in the course of a week, and the embryos bore their way through the wall of the intestine into the abdominal cavity, and pass thence by way of the connective tissues to the muscles or to other serous cavities; or they make their way through the mucous and muscular coats of the intestine and between the layers of the mesentery to the vertebral column, whence they migrate to the muscular tissues. In the muscles they penetrate the primitive bundles and cause destruction of the contractile substance. Occasionally the parasites are distributed through the blood stream and the lymph channels. They continue to develop in the muscles for a short time—from two to three weeks—and as a result of their activity febrile symptoms arise, together with others referable to the invaded muscles. In the course of another week the worms curl upon themselves, and in the further progress of the case the irritation to which their presence gives rise causes the formation of a capsule of connective tissue, by which they become surrounded, and which eventually may undergo calcification. The calcified capsule appears as a small grayish nodule, just visible macroscopically. Sometimes the parasites themselves undergo calcification, and occasionally both parasite and capsule disappear entirely. On the other hand, the parasite may retain its vitality for many years and it may even survive the death of its host. It can be destroyed by a temperature of −11° or of 55° C., although greater extremes of temperature are required when the parasite is encapsulated within muscular tissue.

In addition to human beings, trichinæ have been found in rats, mice, cats, foxes, polecats, martens, and raccoons, and trichinosis has by feeding been induced in rabbits, hares, marmots, hedgehogs, moles, sheep, calves, horses, hens, pigeons, and ducks. Dogs are not readily infected. Trichinæ ingested with food remain at times alive for several days in the larvæ of flies. Swine are generally infected through eating the flesh of infected swine fed to them, and occasionally through the flesh of rats infected by eating the refuse from infected porcine cadavers. It is possible also for infection of swine to take place through the ingestion of intestinal discharges from infected human beings or other animals. In man the danger of infection is greatest from the use of raw or imperfectly cooked pork, and it is slightest when the pork is well cooked or roasted. The trichinæ can be destroyed by cooking, provided the temperature in the interior of the meat reaches 75° C. Well-pickled meat is less infective than fresh meat, the trichinæ being destroyed in part by the necessary withdrawal of water. The danger of infection from meat is lessened also by thorough smoking.

Morbid Anatomy.—When opportunity is afforded for post-mortem examination in cases of trichinosis, the mucous membrane of the small intestine is found swollen, in recent cases injected, at a later stage pale. At times there is capillary hyperæmia and there may even be ecchymoses. Swelling of the solitary follicles and of Peyer's patches has been observed, with enlargement of the mesenteric glands. The parasites may persist in the bowel for as long as seven or eight weeks. The spleen is little changed, if at all. The liver becomes pallid and

anæmic and of doughy consistence, and its cells the seat of fatty infiltration. The kidney exhibits cloudy swelling or fatty degeneration. The myocardium also may undergo cloudy swelling. The lungs exhibit the signs of bronchitis, with hypostasis, and they may undergo splenization or lobular hepatization. Rarely they are the seat of metastatic abscesses or of hemorrhagic infarction. The muscles may in the first week be light grayish-yellow, dark-red or bluish-violet in color. At a later period the muscle fibres undergo longitudinal and transverse splitting, and degenerative changes take place in the contractile substance, together with hyperplasia of the interstitial connective tissue. Trichinæ may be present in large numbers, especially at the junction of the belly and the tendon of the muscle. They predominate in the diaphragm, the intercostal, the cervical, the laryngeal and the ocular muscles. In the extremities they occur especially in the biceps and the triceps. They have been found also in the heart muscle. Large numbers of polymorphonuclear leucocytes, more especially eosinophile cells, have been described in the affected muscles, particularly in the more degenerated areas.

Symptomatology.—The intensity of the symptoms of trichinosis varies in accordance with the number of parasites introduced into the digestive tract. Three phases of the disease may be considered, namely, that of the entrance of the parasites into the stomach and the small intestine, that of their migration to and through the muscles, and that of encapsulation, with subsidence of the myositis. These are, however, not distinguishable clinically. The ingestion of trichinous meat is followed shortly by symptoms of marked digestive derangement. Among the more common of these are malaise, nausea, eructation, vomiting, and cardialgia, and with them may be associated vertigo, a sense of fulness in the head, and of heaviness in the lower extremities. In some cases the symptoms of an acute gastro-enteritis develop, with diarrhœa, hypogastric pain, weakness, and fever. The diarrhœa may be succeeded by constipation. The appetite is lost, or there may even be repugnance for food. Thirst is increased and sweating may be free. On the other hand, this train of symptoms may be wanting, wholly or in part. The tongue may be dry; it is often swollen and painful, and it may be movable only with great difficulty.

Rheumatoid pains in the extremities develop gradually, with ill-defined feelings of illness. Fever appears, and some of the muscles begin to swell. The affected parts become œdematous and the seat of pain and tenderness. The muscles exhibit weakness and want of elasticity, and there is a sense of soreness such as is observed after unusual exercise. This is noticeable especially in flexion and in the muscles of the neck, and often also in the lumbar muscles. Patients complain further of a sense of heaviness and weight in the extremities.

Febrile symptoms appear, as a rule, on the third or fourth day of the disease, being ushered in by repeated chilliness, rarely by a severe chill. There is slight elevation of temperature in association with the gastro-intestinal symptoms, but the pyrexia becomes more marked with the onset of the symptoms referable to the muscles. The temperature may reach 40° or 41° C. in the afternoon, declining a little in the morning, and being of remittent or subcontinuous type. This higher degree of pyrexia persists for from nine to eleven days, and it is succeeded by a lower range of temperature for a further period of from three to five weeks. In mild cases the temperature may return to the normal level in the third week, or it may become intermittent in character. Defervescence is usually gradual and slow. The pulse frequency corresponds with the degree of pyrexia.

Œdema of the face, especially of the eyelids, appears in the second week of the disease, and is one of the most characteristic and most constant symptoms. There may be an associated chemosis of the conjunctiva. Œdema of the extremities is less common. This symptom, when present, disappears in from two to five days, but it may reappear later.

The trichinæ invade the muscles, and the symptoms referable to these appear at the end of about nine or ten days, though sometimes later, in accordance with the intensity of the infection. The affected muscles become swollen, hard, and sensitive to touch and pressure. Movement induces cutting or boring pain. Such pain as is present is naturally less when the parts are at rest. In mild cases there may be merely a sense of stiffness and of tension. Any muscle of the body may be invaded, but especially those of the extremities and of these particularly the flexors are affected. The patient assumes a characteristic attitude, in consequence of his efforts to relax the involved muscles. In the dorsal decubitus arm, forearm, and hand are flexed at an acute angle, and the lower extremities are partially flexed at the knee and the hip. Stiffness and rigidity are apparent especially in the masseters and the muscles of the neck and the upper extremities. Frequently there is difficulty in deglutition from invasion of the muscles of the tongue and the pharynx, and there may be trismus. Involvement of the muscles of the larynx gives rise to hoarseness and aphonia; of the respiratory muscles, to difficulty in breathing and dyspnœa. Deep inspiration induces dry cough. Œdema of the glottis may develop and give rise to alarming if not dangerous symptoms. In severe cases the ocular muscles may be the seat of pain. This often occurs only on movement, which in consequence is embarrassed. At times the eyes exhibit increased sensitiveness to light, and there may be conjunctivitis and ecchymoses in the scleral conjunctiva. Mydriasis has been observed in some cases.

Pruritus is a frequent symptom, while formication and cutaneous anæsthesia are less common. Eruptions on the skin, such as acne, furunculosis, herpes, petechiæ, prurigo, and urticaria, are not rare as late manifestations. Free desquamation occurs frequently during convalescence. Sweating may be a troublesome feature in both mild and severe cases, and not rarely it continues throughout the course of the disease. Bronchitis is often present early, while in some cases hypostatic and even fibrinous pneumonia develops, and occasionally pleurisy. At times cardiac irritability appears in the second week. Pericarditis also has been observed. In severe and protracted cases venous thrombosis may occur, particularly in the lower extremities, as a result of marantic enfeeblement of the circulation. Rarely epistaxis and intestinal hemorrhage occur, while oligæmia, oligocythæmia, and hydræmia develop early. In the acute stage of the disease the blood exhibits characteristic alterations. The number of leucocytes is increased, at times to a remarkable degree. As many as 35,700 in the cubic millimetre have been reported. This increase involves especially the eosinophile leucocytes, both absolutely and relatively, with coincident diminution in the proportion of polymorphonuclear neutrophile leucocytes. The percentage of eosinophiles has been reported as high as 68.2 per cent., as against the normal of two or three per cent., the percentage of neutrophiles at the same time being 6.6 per cent.

The urine is diminished in amount and is high-colored during the febrile stage, and when sweating is profuse. At a later stage the amount may be increased. Occasionally albuminuria is present, together with tube casts and renal epithelium. Disorders of menstruation are frequent in women, and abortion is not rare when pregnancy exists. Trichinæ have, however, not been found in the fœtus. Insomnia is a constant symptom at the height of the disease, and is invariably present in severe cases. Even in mild cases sleep is disturbed by restlessness. Children, however, may sleep well throughout the disease. The superficial and deep reflexes and the electric irritability to both faradic and galvanic currents are enfeebled. Consciousness is rarely deranged. In some cases impairment of hearing occurs.

The period of incubation of trichinosis—that is, the period of time that elapses between the ingestion of trichinous meat and the development of symptoms—is variable, and may be from a few hours to many days or even

weeks. As a rule the first conspicuous symptoms appear during the second or the third week. In mild cases the attack lasts for from one to two weeks. Fever is then likely to be wanting. In severe cases the duration of the attack may be from five to seven weeks to months. The disease not rarely terminates in death. When this occurs it usually does not take place in the first two weeks, but principally between the fourth and the seventh weeks. It is most commonly preceded by symptoms of respiratory paralysis, at times by high fever and typhoid symptoms. Death may be due to complicating pneumonia. The mortality is variable, in different epidemics ranging from none to thirty per cent. In large numbers of cases it averages about five per cent. In children recovery is almost invariable.

Diagnosis.—The diagnosis of trichinosis is based upon the presence of the gastro-intestinal symptoms of the onset of the disease, followed after a varying interval by the development of the symptoms referable to the muscles, with fever, transitory œdema of the face, hoarseness, difficulty in swallowing, profuse sweating, dyspnœa, sleeplessness, and the characteristic changes in the blood, taken in conjunction with the knowledge of a source of infection. In doubtful cases microscopic examination of the stools may disclose the presence of ova or of mature parasites in the stools, or of parasites in a bit of excised muscle, preferably the biceps or the deltoid. Similar examination of any remaining suspected food may yield conclusive evidence of the infection.

If the early gastro-intestinal symptoms of trichinosis are violent they may suggest the existence of cholera; but the characteristic muscular symptoms, the weakness, the sweats, the neuralgic abdominal pains, the changes in the blood, the protracted course, and the absence of the characteristic intestinal discharges, will remove doubt in this connection.

In cases of botulism—poisoning with sausage or meat—the symptoms appear earlier than in cases of trichinosis, and the disease pursues a more rapid course. There is profound depression of the nervous system, with an absence of the peculiar muscular phenomena and of œdema, and the presence of visual derangement, dryness of the throat, slowing of the pulse, icteric discoloration, and dryness of the skin.

The febrile symptoms of trichinosis may suggest typhoid fever, but the presence of the pain and stiffness in the muscles and of œdema of the face, the leucocytosis and the eosinophilia, the results of histologic examination of a bit of muscle, the failure of the blood to cause agglutination and sedimentation of typhoid bacilli in culture, the absence of the diazo-reaction, of rose spots and of enlargement of the spleen will aid in the differentiation.

Mild cases of trichinosis may simulate so-called muscular rheumatism or myalgia from various causes, but the early gastro-intestinal derangement, the puffiness of the face, the respiratory difficulty, and the blood state should be sufficient to prevent error here.

Acute progressive polymyositis is to be differentiated from trichinosis by the absence of gastro-intestinal symptoms and also of the specific etiologic factors, while examination of a bit of muscle will disclose the presence of signs of inflammation, but not of trichinæ.

Prognosis.—The course and termination of an attack of trichinosis depend upon the severity of the infection. When the trichinæ are present in large numbers in the ingested meat, and the method of preparation is inadequate for their destruction, the resulting disease is likely to be severe; while under the reverse conditions the disease is likely to be mild. In general, further, the earlier the appearance of the symptoms the more intense is the infection and the more severe the course of the disease. Persistent and profuse diarrhœa is of evil prognostic omen, as is also initial constipation. The presence of persistent high fever, with slight remissions, of severe and widely distributed muscular pains, of extensive involvement of the respiratory muscles, of intense dyspnœa, of profuse sweats and diarrhœa, of cardiac weakness, of tremor, of delirium and of coma are indicative of an unfavorable prognosis. Want of completeness in the development of the characteristic symptoms, undisturbed sleep, integrity of the respiratory functions and of the circulation after the second week are of favorable prognostic significance. In general the prognosis grows progressively more favorable with the duration of the disease. In mild cases and in children the prognosis is absolutely good.

Prophylaxis.—Human beings can be protected against trichinosis by preventing the spread of the disease in swine. This end can be attained by forbidding the feeding of offal to animals, by systematic and thorough inspection of meat proffered for sale, by prohibition of the sale of trichinous meat, by thorough pickling or smoking, but above all by thorough and prolonged cooking of all meat, and especially of pork, used as food.

Treatment.—Should the patient come under observation soon after the ingestion of the infected meat, emetics or purgatives may be administered, in order so far as possible to expel ova set free in the gastro-intestinal tract. An ounce of castor oil may be employed for this purpose. Anthelmintics have not been found useful, nor have digestive agents proved efficient. Glycerin has been administered in drachm doses every hour for ten or twelve hours consecutively, with the object of abstracting water from the ova, and thus rendering them inert. Benzin has been employed as an anthelmintic, and has been administered internally and also by enema. It may be given by the mouth for several days consecutively in doses of from forty-five to ninety minims in combination with laxatives, and be introduced into the bowel as an addition to an enema through the long rectal tube in doses of from forty-five minims to two drachms. Santonin may be administered in doses of from one-fourth to one grain twice daily, alone or in conjunction with laxatives.

Severe individual symptoms may require special treatment. The initial gastro-intestinal symptoms generally subside spontaneously. In any event remedies that predispose to constipation are strictly to be avoided. To insure thorough evacuation of the bowels laxatives, such as calomel, castor oil, salines, and the like may be administered. For the relief of the muscular pains and stiffness prolonged warm baths may be employed, but they cannot be used if the pain is severe. Inunctions with tepid oil or friction with chloroform or turpentine may afford temporary amelioration. Sleeplessness may be overcome by the use of morphine, but this should be avoided if paralysis of the respiratory muscles is threatened. Hot affusions may aid in inducing sleep. The sleeping-room should, of course, be well ventilated and be kept cool. Sponging with cool water, to which aromatic spirit of ammonia or alcohol is added, also large doses of quinine and the administration of atropine, will prove serviceable in the relief of sleeplessness due to profuse sweating. The application of wet cups to the back will temporarily mitigate the severity of the dyspnœa. Emetics sometimes bring about the same result. In the presence of bronchitis expectorants may be indicated. The diet should be bland, simple, easily digestible, and nutritious.

Augustus A. Eshner.

TRICHLORACETIC ACID.—$C_2HCl_3O_2$. This is one of three chloracetic acids produced by the substitution of chlorine for hydrogen atoms. It is a colorless crystalline salt, deliquescent and freely soluble in water, alcohol, and ether; it has a faint odor and a sharp caustic taste.

This acid is used as a very convenient and delicate test for albumin in the urine. A crystal is to be dropped into the urine, where it rapidly dissolves and produces a cloudiness if albumin is present. A saturated solution may also be used, a few drops being allowed to fall upon the surface of the urine; at the point of contact a cloudiness is at once observed.

This test was proposed by Boymond (*Répert. de Pharm.*, October, 1889), and has been indorsed by numerous observers. The reaction is very prompt and does not require to be confirmed by heat, as peptones are not acted upon. The only danger to be guarded against is the presence of an excessive amount of urates, which will cause a similar cloudiness. This, however, is very slow in appearing and may be overcome by diluting the urine with water.

The chloracetic acid has also been recommended as an escharotic to replace chromic acid. The advantage of this cauterization is that the effects are very localized and do not extend into the surrounding soft tissue. It has been used with success in the treatment of venereal warts, papillomata, and other cutaneous growths. It is used pure, a crystal being placed upon the part, which produces its effect at once. A dry, white, adherent scab forms, which detaches itself after a few days without causing any reaction whatever, and leaving a raw surface which rapidly cicatrizes. A single application may be sufficient for small growths, while for larger ones it may be necessary to repeat the application several times.

These are not very painful, and may be rendered painless by the use of cocaine. Nævi are also reported to have been cured by three or four applications, the cicatrix remaining being very superficial and hardly noticeable. It has also been used successfully in the treatment of chronic inflammations and hypertrophied conditions of the mucous membrane of the nose and throat. In chronic gonorrhœa it has been used by applying it directly to the source of the trouble by the aid of an endoscope.

Beaumont Small.

TRICHOCEPHALUS DISPAR. See *Nematoda.*

TRICHOPHYTOSIS. See *Tineas, The.*

TRICRESOL is a clear, colorless (reddish when older) watery liquid claimed to consist of 35 parts of orthocresol, 40 parts of metacresol, and 25 parts of paracresol. It is soluble in 50 parts of water, and readily in alcohol, ether, and the fatty oils. Major Reed, in a bacteriological investigation, obtained prompt destruction of many pathogenic bacteria by a one-per-cent. solution.

Tricresol was designed as a purified substitute for creolin or lysol, a liquid similar to the latter being prepared by adding 50 parts of tricresol to 35 of soft soap and 15 of water. For use, 4–30 c.c. (ʒ i.–ʒ i.) of this mixture is added to one or two litres (quarts) of water. Tricresol has been used for sterilizing instruments, and as a preservative of diphtheria antitoxin. Some of the untoward effects of antitoxin have been attributed to tricresol. De Schweinitz and subsequently Jackson found one part in a thousand an excellent non-irritating preservative of eye washes. McGowan cites a number of cases indicating its efficiency in alopecia areata; other observers have used it much as a vaginal douche; and Vopelius has given it internally in dose of ten to fifteen drops as a substitute for creosote in respiratory troubles. (See also article on *Ethylene-diamine.*)

W. A. Bastedo

TRICRESOLAMINE. See *Ethylene-diamine.*

TRIFACIAL NERVE. See *Cranial Nerves.*

TRIFORMOL. See *Paraform.*

TRI-IODO-META-CRESOL. See *Losophan.*

TRIMETHYLAMINE.—$N(CH_3)_3$. Trimethylamine is a tertiary monamine, found native in various plants and also in various animal fluids, notably in *herring-brine*, whose strong, rank odor is due to this ingredient. Prior to the researches on the amines by Hofmann, native trimethylamine was thought to be the isomeric body, *propylamine*, $NH_2(C_3H_7)$, and considerable confusion still exists in medical understanding on the subject, through the misapplication of the term *propylamine* to what is, in truth, *trimethylamine*. As a matter of fact, *propylamine*, properly so called, is not, and never has been, used as a medicine, and all medical preparations passing under that name are preparations of trimethylamine. Trimethylamine is a mobile, colorless liquid of the specific gravity 0.673 at 0° C. (32° F.), and boiling point between 9° and 10° C. (48.2° and 50° F.). It is very soluble in water, which fluid also eagerly absorbs and dissolves the vapor of trimethylamine. It is combustible, and so, too, is its concentrated aqueous solution. Trimethylamine has a powerful and very searching ammoniacal and fishy odor.

For medical purposes an impure solution in water, prepared from herring-pickle, was first employed. This solution contained also ammonia and various undetermined ammoniacal compounds, and probably other organic matters. Its proportion of trimethylamine was variable, in accordance with the varying constitution of the samples of herring-pickle of different years' make. Hence, of later years, the definite salt *trimethylamine hydrochloride*, $N(CH_3)_3HCl$, was proposed. This salt occurs in white, very deliquescent crystals, freely soluble in water, and is the best form of trimethylamine for medical administration.

Trimethylamine is a powerful irritant, its concentrated solution being even mildly caustic. Taken internally, large doses—such as in excess of 2.00 gm. (about thirty grains)—produce decided symptoms of gastro-intestinal irritation with burning in the throat and stomach. After absorption the medicine evinces a tendency to depress the force and frequency of the pulse, the body temperature, and the excretion of urea.

Trimethylamine was at one time used for the treatment of rheumatism and gout, but of late years has been so completely superseded by the salicylates as to have become obsolete as a medicine. If used at all, the drug is best administered in the form of an aqueous solution of the hydrochloride, aromatized to cover the rank, fishy taste. The dose of hydrochloride will range between 0.25 and 0.50 gm. (between four and eight grains, about), several times a day.

Edward Curtis.

TRIONAL and **TETRONAL.**—These two hypnotics are closely allied to sulphonal, being formed by substituting ethyl groups for those of methyl. In sulphonal there are two ethyl and two methyl groups; in trional an additional ethyl group replaces a methyl group; and in tetronal the two methyl groups are replaced by two of ethyl. The following formulæ explain the differences in their construction:

Sulphonal, $(CH_3)_2C(SO_2C_2H_5)_2$; trional, $C_2H_5CH_3C(SO_2C_2H_5)_2$; tetronal, $(C_2H_5)_2C(SO_2C_2H_5)_2$.

They are the result of a series of experiments for the purpose of determining upon which of the radicals the therapeutic action of the several sulphones depended (*British Medical Journal*, January 11th, 1890). The sulphur-containing radicals were generally supposed to be the active element, but it was found that these had little influence, while the various compounds were more or less active, according as they contained a greater or smaller number of the ethyl groups. Sulphonal with two ethyl groups possessed a certain hypnotic action; when the number was increased its therapeutic power became greater, and when fewer groups were introduced it became correspondingly less. To the compounds containing three and four groups, respectively, the names trional and tetronal were given, the title indicating the number of groups present. They both form in lustrous, tabular crystals; soluble in alcohol, but only slightly so in water—trional to the extent of one part in three hundred and twenty; tetronal, one in four hundred and fifty. The taste of both is bitter, somewhat resembling camphor.

Trional has proved to be an excellent hypnotic, and it is now employed almost to as great an extent as sulphonal. Tetronal, on the other hand, has fallen into disuse. It has proved less manageable and ill effects after its employment are very frequent.

The action of trional is the same as that of sulphonal but more rapid and certain. It acts in from fifteen minutes to half an hour. There is not the delayed action, nor the prolonged sleep that frequently accompanies the

effect of sulphonal. It, however, more frequently gives rise to toxic symptoms. These are the same as are caused by sulphonal: lassitude, giddiness, ataxic symptoms, nausea, irritation of the kidneys, diminished secretion of urine, with discoloration due to *hæmatoporphyrinuria*. Cases of prolonged peripheral neuritis have also been reported to have followed its administration. No deaths have been reported from single doses, but many fatalities have followed its prolonged use. A cumulative effect has been noted, which is observed when chronic constipation is marked. A peculiar camphoraceous odor of the urine is an early sign of its toxic action.

The dose is from ten to twenty grains, in hot milk, at bedtime. It has recently been shown that when given in water charged with carbonic acid gas, its action is much more marked, and that ten grains will produce its full effect. Seltzer water is selected for that purpose.

Beaumont Small.

TRIONAL, POISONING BY. See *Synthetic Products, Toxicology of.*

TRIOXYBENZOPHENONE. See *Salicyl-resorcin-ketone.*

TRIOXYMETHYLENE. See *Paraform.*

TRIPHENETOL GUANIDINE HYDROCHLORIDE is a local anæsthetic used in eye treatment in 0.1-per-cent. solution. Anæsthesia is prompt and the pupil is not dilated. *W. A. Bastedo.*

TRIPHENIN, $C_6H_4.C_2H_5O.NH.CH_3CH_3CO$, obtained by heating paraphenetidin with propionic acid, differs from phenacetin only in the substitution of the propionyl radical for the acetic. It occurs as an odorless, white, crystalline powder of feebly bitter taste, and is soluble in two thousand parts of water. It is antipyretic and analgesic, its action being practically that of phenacetin. Dose 0.3–0.7 gm. (gr. v.–x.).

W. A. Bastedo.

TRITICUM. See *Dog-grass.*

TROPACOCAINE HYDROCHLORIDE, $C_8H_{14}.NO.C_7H_5O.HCl$, is benzoyl-pseudotropeine, a principle at first isolated from a Java coca leaf, but now prepared synthetically from atropine or hyoscyamine. It forms colorless crystals which are readily soluble in water and have strongly alkaloidal properties. Resembling cocaine in its physiological effects, tropacocaine is said by Vamossy to be much less toxic and more rapid in its local action, and to cause none of the ischæmia, hyperæmia, and irritation of cocaine. It is employed in solution of one-half to ten per cent. in the same manner as cocaine, but its use is confined to that of an anæsthetic.

In spinal anæsthesia, K. Schwarz, who employed it in one hundred cases, reports better results than with cocaine; but two of the cases had vomiting and eleven headache, and there was more or less pallor, cyanosis, slow pulse or fever. Neugebauer, McLean of Detroit, Willy Meyer, and Fowler prefer it in spinal analgesia, while Bier thinks cocaine superior. For use in the eye Vamossy recommends ℞ Tropacocaine 0.3 gm. (gr. v.), sodium chloride 0.06 gm. (gr. i.), and distilled water 10 c.c. (℥iiss.), a solution which is non-irritating and strongly anæsthetic, and has little, if any, mydriatic action. Veasey considers the drug especially valuable in keratitis, as it does not deplete the corneal blood-vessels. Its action seems to be very rapid; Silex was able to perform a painless tenotomy one minute after the application of a three-per-cent. solution. Hugenschmidt injected 0.04 gm. (gr. ⅔) in his own lower jaw region, and in three minutes he became dizzy, felt precordial anxiety, and exhibited a marked lowering of blood pressure. Ten minutes after the injection the effect had passed away. In dental surgery Pinet and others recommend it highly, either as a hypodermic injection or in ten-per-cent. solution locally applied.

W. A. Bastedo.

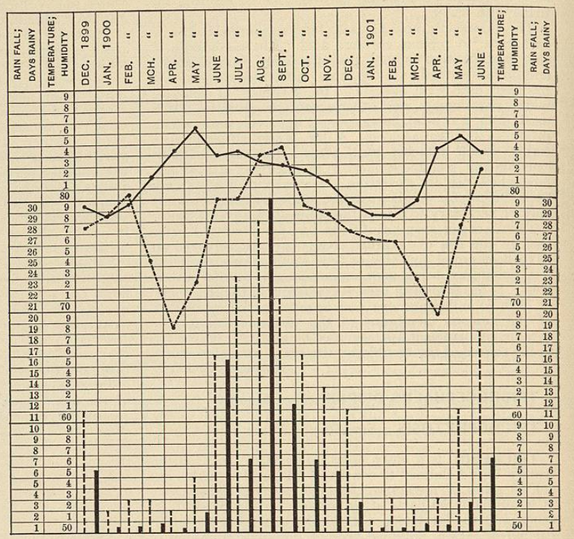

FIG. 4803.—Description of Chart. Each horizontal line represents one degree of temperature and humidity; one rainy day and one inch of rainfall; each perpendicular line, one month; continuous heavy curve, average mean monthly temperature; light broken curve, average mean monthly humidity; heavy black lines in right side of monthly columns, rainfall in inches per month; heavy broken lines near centre of monthly columns, number of rainy days per month; inside column of figures marks degrees of temperature and humidity; and outside figures, number of inches of rainfall and rainy days per month.

TROPICAL DISEASES: GENERAL INTRODUCTION.—Those who desire to acquire a satisfactory knowledge of "tropical diseases," as they are encountered in some special part of the world, must first acquaint themselves to some extent with the surface configuration of the country which is under consideration, with its climatic characteristics, its fauna and flora, and with its people, and then they must study the pathologic aspects of the diseases themselves.

Climate.—To present more clearly the essential features of climate, chart Fig. 4803 has been constructed from data collected in Manila, P. I. Although it is based upon the climatic phenomena observed at only one place in the Philippines, it will serve for most tropical localities, except those situated far inland, where the rainfall may be greatly diminished and where intense hot winds prevail instead of the more pleasant sea breezes.

An analysis of the curves for temperature and humidity shows that these curves cross the 80° (and 80 per cent.) line in February, June, October, and December, thus permitting a more or less arbitrary division of the tropical year into seasons. It will be observed that during December, January, and February, the temperature and humidity are below 80° and 80 per cent.; that during December and a part of January there are a relatively large number of rainy days, but relatively little rainfall; that, as the season progresses, the number of rainy days and the number of inches of rainfall gradually diminish until February, when almost no rain falls. These months are the coldest of the year, and constitute what may be termed the winter season. During the winter the early morning, the late afternoon, and the nights are cool, often cold, on account of the cool monsoons from the north. On the other hand, the middle portion of the day is warm, with blue skies dotted with numerous white clouds. In other words, the days at this season, which is by far the most pleasant of the year, resemble those of our early autumns.

About the first of March the temperature gradually rises above 80° F., each day being just a little hotter than the preceding. In April and May the highest temperature is noted. As the temperature rises humidity sinks to its lowest point in April and May, when the increased rainfall produces a gradual rise to 80 per cent., about the first of June. This is the hot, dry season which continues from the rise of temperature above 80° in March to the rise of humidity above 80 per cent. in June. During this season the temperature is regularly high; humidity low; monsoons frequently absent and often hot, and the skies more or less dotted with white clouds. This is the most unpleasant season of the year. To recapitulate, the hot, dry season continues from early March to June; the temperature is regular and high; humidity low; rainfall almost nil; monsoons often absent and often hot.

In June the number of rainy days and the number of inches of rainfall show a decided increase; in some regions the rainy season may be ushered in by a typhoon. This season continues from the rise of humidity above 80 per cent. in June, to the fall of temperature below 80° F. in November. During the early months, the temperature is a few degrees lower and more irregular than in the hot, dry season. Often during a typhoon relatively low temperatures (62° to 70° F.) are noted. In the last months of the rainy season the temperature gradually sinks below 80° F., when the season merges into winter. The humidity is high; during a typhoon the atmosphere is saturated. These typhoons occur from June to October. They are circular wind and rain storms, the centre of which slowly moves along a fairly well-defined path from southwest to northeast. The nearer the centre is approached, the severer the storm becomes. Destructive winds are frequent during these storms, and the rainfall is often extraordinary; as much as sixteen inches of water having fallen in one day. In the absence of typhoons light showers occur daily. Often every day is rainy. To recapitulate, the rainy season continues from June to November; the temperature is high and irregular; the humidity is high and the rainfall is great; typhoons may occur during this period. The change from one season to another is very gradual.

Throughout the year, monsoons materially diminish the discomforts of a tropical climate. They are winds, the direction of which depends on the location of the centres of high and low pressures. During the summer months the prevailing direction of the wind is toward the north —*i.e.*, toward the northern low-pressure centres. Coming from the equator, these monsoons are warm, often hot. On account of the northern high-pressure centres, winter monsoons have a southerly direction (*i.e.*, they blow from the north) and are cool. Monsoons naturally influence the climate.

In addition to the regular monsoons there are, along the coast, local land and sea breezes which serve to moderate a tropical temperature. These breezes are produced by the difference between the land and the waters as regards the radiation of heat. As heat radiates more rapidly from land, there are, in the late afternoon and during the evening, light winds from the water, whereas in the early morning light breezes blow from inland. These breezes may slightly change the direction of monsoons.

The range in temperature between the hottest and coldest seasons is only eight or nine degrees. This change, with that in humidity and in the monsoons, produces an effect which is felt by the individual in a more decided manner than is shown by the thermometer. The chief features, then, of a tropical climate are a hot, dry season, a rainy season, and a winter season, with a constantly high temperature in each. The latter is the most important feature and more accurately defines the word "tropical" in the expression "tropical diseases" than does the mere geographical signification of the term. In this sense a portion of the year in temperate climates is tropical, and the duration of this tropical period gradually increases as the distance from the equator diminishes, until the Tropic of Cancer and Tropic of Capricorn are reached. Within these parallels the entire year is tropical.

The term "tropical diseases," if used in its strictly geographical sense, includes only a few unimportant diseases; while in the broader sense (which has been given to it in the preceding paragraph) it may properly be said to include the following classes of diseases: First, a small group of unimportant diseases occurring only in the tropics. (Type: yaws.) Second, a larger group of diseases which occur in the tropics and subtropics, and occasionally during the hot months in temperate climates. (Type: yellow fever; dengue.) Third, a group of diseases which occur in all climates, but more persistently in the tropics and subtropics. (Type: malaria.) Fourth, a group of diseases which arise in tropical and subtropical regions—in which they are endemic—and at varying intervals of time spread to different parts of the world. (Type: bubonic plague and cholera.)

In addition to the above-mentioned classes, many diseases common to temperate climates are present in the tropics, but to include them in "tropical diseases" would necessitate a discussion of the entire realm of medicine. Diseases which are produced by factors that constitute an integral part of certain meteorological conditions are very few and, as a rule, unimportant. Except in rare instances, they may be prevented. Here may be mentioned frost-bite, sun-stroke, heat-exhaustion, etc.

Indirectly, climate plays an important rôle in all the diseases that are caused by specific agents, the viability, reproduction, pathogenicity and dissemination of which may be greatly influenced by cold, heat, drought, rain, etc.

The Surface Features of the Country.—The topography of tropical countries is essentially the same as that of countries belonging to higher latitudes. In some districts, by reason of their high elevation, several distinct climates may occur within a remarkably limited area. Woodland, often with heavy undergrowth, is abundant. This feature materially aids the long and severe rainy season to supply numerous small streams which often overflow the lowlands. The soil, which in general is very fertile, plays little or no part in the problem of tropical diseases.

The Character and Condition of the People.—Ignorance and poverty are the prevailing conditions in most of the tropical races. At the same time they are, as a rule, very prolific.

History gives us very little information in regard to the rise and progress of these nations. Most of them were found in a barbarous or semibarbarous state; consequently they fell an easy prey to any or all who had time or inclination to mix in their affairs. Generally speaking, their education has been little advanced. In many of the larger cities schools, colleges, etc., and in some country districts a few schools may be seen, but the type of these seats of learning has not been all that might be desired, and at best only a limited number could be benefited. Religions of various kinds have, too