describes the odor as "pungent, ammoniacal, and offensive."

Other changes occur in the skin, among which may be mentioned herpes facialis, which is not infrequent, miliaria crystalina (sudamina crystalina), icterus, abscesses, and bedsores.

Nervous Manifestations.—Foremost among the many nervous manifestations of typhus fever is the early and pronounced prostration. The patient is quickly overcome by the intensity of the toxin and immediately takes to bed. Symptoms of nervous excitement often precede the prostration for a few days. He complains of severe frontal headache, pain in the eyes, vertigo, and pain in the sacrum. Insomnia soon becomes a prominent symptom; and if he does sleep, frightful dreams disturb him. Consciousness is maintained for some days, but sooner or later he grows dull and apathetic. Hallucinations of impending harm are very common. Toward the end of the first week the stupor increases, consciousness is finally lost, he mutters to himself, and picks at the bedclothes; there is subsultus tendinum. He may lie with his eyes wide open, unconcerned as to what takes place about him (coma vigil). Delirium of varying degrees is almost constantly present. Even after the temperature has returned to normal delirium may persist. Not uncommonly during the height of the disease, especially in young robust individuals, it takes on a maniacal form; they seek to escape from their terrifying hallucinations by suicidal attempts. On the other hand, depression may predominate. Among other nervous phenomena which deserve a passing notice are convulsions, hemiplegia, and meningitis. Sensory disturbances probably exist at times, but of this we have little definite knowledge.

The Blood shows few important changes; a moderate leucocytosis has been observed. The other changes are those of secondary anæmia—reduction of the red corpuscles and hæmoglobin. This is more noticeable during convalescence from a severe attack. No degenerative changes in the red cells have been observed. The serum does not agglutinate the bacillus typhosus. Little significance is now attached to the changes in the coagulability of the blood, described by the older writers.

Special Senses.—*Eye.*—Of the disturbances of the special senses those of the eye are perhaps the most prominent. Catarrhal conjunctivitis, and even in mild cases keratitis sometimes leading to the perforation of the cornea, and conjunctival hemorrhages may occur. In severe cases the pupils often become markedly contracted in the later stages of the disease; vitreous opacities and choroiditis, iritis and atrophy of the optic nerve have been observed.

Ear.—Disturbances of hearing are common. They usually occur during convalescence; very seldom when the disease is at its height. Hartmann found aural disease in forty-two of one hundred and thirty men during convalescence. The conditions most frequently met with are catarrhal inflammation of the Eustachian tubes and tympanic membrane, purulent otitis media, and perforation of the tympanum.

Renal System.—The ordinary febrile characters of urine are usually present. Retention is not uncommonly met with in women, but is rare in men. More or less definite changes occur in the solids. The chlorides are markedly diminished, and in the later stages of the disease it may be impossible to demonstrate them. Uric acid is almost always increased, but there is practically no variation in the percentage of urea. During the height of the disease there may be a transitory polyuria. At this time the urine is very pale. Albuminuria is common; when moderate it is of no significance. It may, however, be severe and accompanied by hæmaturia, epithelial and hyaline casts, and all the indications of parenchymatous change in the kidneys.

The diazo reaction, as has been pointed out by Vierordt and others, occurs with considerable regularity. Littlejohn obtained it in fifteen of his eighty-two Edinburgh cases. Gerhard's ferric chloride reaction is not infrequently obtained.

Generative System.—Orchitis is even more rarely met with in typhus than in typhoid fever. Menstrual changes are particularly common. The menses may be copious and appear prematurely; but if the disease develops soon after a menstrual period, menstruation may be suppressed until convalescence is well established. Pregnancy exerts no influence on the course of the disease; abortion is very uncommon. The fœtus may be infected (placental transmission), as has been described in the section on etiology.

Respiratory System.—Tracheal and bronchial catarrh occurs so frequently that it may be considered a part of the disease. It is present in the beginning and continues through the height of the disease. It manifests itself by frequent cough with slight expectoration of a glairy, sometimes blood-streaked sputum. Pneumonia and hypostatic congestion are among the not infrequent complications which involve the lungs. No cases associated with true diphtheria are to be found in the literature, though diphtheroid conditions are frequently mentioned. Laryngeal complications, such as swelling of the mucous membranes, erosions, fissures, and ulcerative changes in the cartilages, may also occur.

Digestive System.—Aside from the nausea and occasional vomiting which accompany the chills in the beginning of the disease there are no prominent symptoms referable to the digestive apparatus. It is thought by some that the tongue shows fairly constant characters. At first it is moist and is soon covered with a thick yellowish-brown coat; later it becomes dry, cracked and fissured, and tremulous. Sordes collect on the lips and teeth. There may be constipation or diarrhœa.

Varieties of Typhus.—Typhus fever is subject to many variations in its course. The older writers recognized four distinct forms.

1. Inflammatory typhus which occurs in robust young people and is characterized by headache, high fever, and delirium.

2. Ataxic or nervous typhus in which delirium, stupor, and subsultus tendinum are the most prominent manifestations.

3. Adynamic typhus, characterized by marked prostration, enfeeblement of the heart's action, and early tendency to collapse.

4. Ataxo-adynamic typhus, a term applied by Murchison to those cases which possess characters both of the ataxic and of the adynamic varieties. These forms, as it will be seen, are simply modifications of the ordinary form of typhus due to the prominence of certain symptom groups.

Ambulatory typhus has been considered very rare. Buchanan,[17] however, states that he has often seen the eruption out on patients who have walked to the London Fever Hospital; and there are other well-authenticated instances of this form. According to Griesinger and Wyss the greater number of cases of this form occur in young children.

Mild and Abortive Forms.—Mild forms of typhus are less frequent than in typhoid. In these cases the onset is generally mild. The fever is often irregular, and reaches the normal after many days. These are known as "*febris exanthematica levissima.*" In abortive typhus the onset is usually marked by a violent chill, and the temperature reaches its height by the end of the first or beginning of the second day. It continues with remissions for four or five days, when it drops by crisis, reaching the normal point within a few hours. (See temperature chart, page 933).

Malignant cases, whose duration may be rapidly fatal, occur. They are known as typhus siderans and blasting typhus. Subfebrile and afebrile cases have been reported.

Relapses and recurrences are not common; indeed it has been questioned whether relapses occur at all. Nevertheless a few undoubted cases have been reported. Buchanan records one among five thousand cases at the

London Fever Hospital and Curschmann two among his cases. Curschmann is inclined to regard his cases as anomalous.

Diagnosis.—During an epidemic the diagnosis of typhus fever is not difficult. Unless isolated cases are typical and can be watched for a number of days until the eruption develops, it may be impossible to be certain of the diagnosis. There are a number of diseases which may be confounded with typhus fever. They are here given in the order of their importance:

Typhoid Fever.—The chief clinical differences between typhus and typhoid are to be found in the temperature and the eruption. The gradual step-like ascent of the fever in typhoid is practically never seen in typhus. The onset in typhus is sudden, the temperature reaching a high point within the first twenty-four hours. The morning remissions are very much smaller in contradistinction to those of typhoid. The temperature curve during the first week in typhus is so characteristic as to be almost pathognomonic. The defervescence in typhus, which never occurs later than the fifteenth or sixteenth day, is always by crisis. So all through the course of the disease it will be seen that the temperature maintains typical differences from that of typhoid. The development of the eruption on all parts of the body, and its tendency to become hemorrhagic, are so different from what occurs in typhoid as to leave little chance for error. However, we are not unacquainted with extensive eruption and the occurrence of petechiæ in typhoid. It is characteristic for the eruption of typhoid to develop in successive crops; such is not the case with the typhus eruption. Early appearance and prominence of psychic disturbances point to typhus. The diazo reaction obtains in both diseases, but the presence of the Widal reaction and the isolation of bacillus typhosus from the blood, urine, or stools are distinctive of typhoid.

Smallpox.—The onset symptoms in smallpox and typhus have much in common. There is very little difficulty in distinguishing between variola vera and typhus, as exactly opposite clinical manifestations are present at the beginning of the eruption in each. *Variola Vera:* Eruption on the fourth day, temperature normal or thereabouts, general symptoms abated. *Typhus:* Eruption variable, third to fifth day, temperature then at its height, general symptoms at their acme. It is often wellnigh impossible, on the other hand, to distinguish typhus from hemorrhagic smallpox—purpura variolosa—as in the latter there is a somewhat diffuse hyperæmic rash on the lower part of the abdomen and in the groins, which soon extends and undergoes hemorrhagic change. Small petechial spots and hemorrhages into the conjunctiva are also seen in this disease. The initial rashes in smallpox seldom confuse the diagnosis.

Measles.—While the catarrhal symptoms very frequently accompany the onset in typhus they are not so marked as in measles. The eruptive stage offers the greatest difficulties. In both the temperature is high and remains so after the eruption appears—the fourth or fifth day. The eruption develops rapidly, is macular, and of a rose-pink color. That of measles occurs first on the face, while in typhus the face is usually exempt. In the early part of the disease Koplik's sign and the crescentic arrangement of the spots in measles are very characteristic. A few days will always suffice to determine the diagnosis, for by this time the hemorrhagic changes begin to appear in the typhus spots.

Relapsing Fever.—Typhus and relapsing fever frequently exist together. Under these circumstances, for a time at least, the diagnosis is obscure. The early finding of spirilla in the blood and the later appearance of a rash speak for relapsing fever and typhus respectively.

Prognosis.—Typhus fever is one of the most dangerous of the acute infectious diseases. The mortality is in direct relation to hygienic and sanitary conditions. It is lowest among those affected at large (ten per cent.); highest where only the poorest hygienic conditions are attainable. Under such conditions the death rate may be as high as fifty per cent. At the London Fever Hospital, for twenty-three years ending 1870, the mortality was eighteen to twenty per cent. Such symptoms as subsultus tendinum, pinhole pupil, coma vigil, and relaxation of the sphincters are exceedingly grave.

Among factors which influence the prognosis age stands foremost. The mortality is low under twenty, high between twenty and thirty, higher between thirty and forty, and highest after forty. The disease is almost always fatal in the intemperate. Other factors which influence the prognosis are weather and season, occupation, and individual predisposition. These have been sufficiently considered elsewhere.

Prophylaxis.—As has been stated before, the prevalence of typhus fever is in direct relation to the efficiency of the sanitary conditions of the locality. "Its appearance in well-regulated civilized communities, where sanitary laws are observed, no longer occasions more than passing alarm." Public and personal hygiene must be carried out with the utmost precision and rigid quarantine instituted. There are three measures that demand more than passing consideration.

1. *Isolation.*—Under all circumstances patients should be segregated in well-appointed special hospitals. Expense is not to be spared by municipalities in establishing such institutions. History has shown us again and again that there is neither reason, philosophy, nor common sense in so doing, for here both patient and public are better served.

2. *Abundance of Air and Ventilation.*—In the warmer months these conditions are well met by placing patients out of doors in open tents. In hospitals the beds in wards must be so arranged that each patient has at least fifteen hundred to two thousand cubic feet of air. Free ventilation calls for the interchange of three thousand cubic feet of air per hour.

3. *Disinfection.*—Linen, urine, stools, cooking utensils, furniture, thermometers, or anything that has in any way, directly or indirectly, come in contact with the patient must be disinfected by the most rigid methods. None of these points should be slighted, the more so since we are entirely unacquainted with the specific cause of the disease, and whether it is present in urine, stools, or the exhalations. To accomplish this, carbolic acid, corrosive sublimate, milk of lime, formalin, and *fire* are necessary. Dead bodies should be cremated.

After recovery the patients should be detained in a detention ward for at least two weeks, and bathed frequently with warm water and carbolized soap.

Treatment.—The general management of typhus fever is the same as for typhoid. The patient's strength requires attention from the beginning. It is necessary, therefore, that the proper amount of nourishment be furnished. Nothing accomplishes this better than the milk diet employed in typhoid fever, and upon which so much has been written. It has been shown that the digestive processes go on more perfectly when patients are fed at frequent intervals. Systematic daily examinations of the stools for undigested particles should be made. It may be necessary to administer hydrochloric acid; indeed during the height of the fever it is good practice to give small doses—fifteen to twenty drops—as a means of stimulating the gastric secretion, which under such circumstances is decreased. Predigested foods are frequently indicated. Because of the large number of inert digesting agents on the market it is absolutely essential that one be used whose value has been recently tested and found up to the mark. Alcohol is to be given when the indications call for it, and coffee appears to have a beneficial effect upon the stupor.

The fever is best controlled by hydrotherapy. Its use in typhus has not been so general as in typhoid, partly because of the unfavorable circumstances which so frequently accompany epidemics of typhus, and partly because of an unfounded opposition on the part of members of the profession. There can be no question but that the mortality has been greatly reduced by this method of treatment. The statistics of Combemale,[22] while not as large as might be wished for, are neverthe-

less not without value. He found that with the expectant plan of treatment the mortality was 35 per cent.; that in patients who received two cold baths daily, after the specifications of Brand, it was 33⅓ per cent., and that among those who received six cold baths daily the mortality was reduced to 16.5 per cent. Curschmann advocates the use of hydrotherapy. He speaks favorably of the water-bed method. The patient is allowed to remain for hours, even all day, in water whose temperature is never carried below 68° or 70° F. The water can be conveniently changed from time to time without disturbing the patient. Curschmann employs the Brand method only in the most severe cases.

Among other hydrotherapeutic measures may be mentioned the cold sponge bath, cold packs and half packs, lukewarm baths, and the graduated full bath. For headache and psychic symptoms the ice cap will be found of great value. Whichever method of treatment is decided upon it must be carried out with great regularity.

The cold baths influence not only the fever, but all the resultant cerebral, circulatory, and respiratory symptoms. At times little decrease in the temperature is observed after the bath, but improvement in the general condition is always seen.

The open-air treatment has already been referred to under prophylaxis, and has much to recommend it. Special nervous, circulatory, and pulmonary symptoms are managed the same as in typhoid fever.

Specific Treatment.—Little has been accomplished in the way of specific treatment. Legrain[23] feels certain of the beneficial effects of the serum treatment. He treated with success a number of cases in a prison by the injection of serum from convalescent typhus-fever patients. Chantemesse also reports success with this method. Because of the limited number of patients treated, little importance can be attached to these reports. It is unfortunate that more work along this line has not been done. It offers another field of research that has probabilities of fruitfulness.

Methylene blue has been considered to have some specific action in typhus fever. Nefedieff,[24] however, reports unfavorable results with this method of treatment. Other so-called specific methods of treatment, as by carbolic acid, sulphocarbolates, and the sulphides, have proved to be of no value.

David Murray Cowie.

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UKIAH VICHY SPRINGS.—Mendocino County, California.

Access.—Viâ San Francisco and Northern Pacific Railroad to Ukiah, thence a drive of three miles to the springs.

This pleasant resort, otherwise known as Doolan's Vichy Springs, lies nestled among enchanting hills, which fringe the boundary line of Lake and Mendocino Counties. This region has a combination of advantages which make it a natural sanitarium. From April to November the climate is delightfully balmy and the atmosphere is pure, clear, and invigorating. The scenery is of a pleasing and attractive character, and the neighborhood of the springs affords excellent fishing and gunning. The waters belong to the alkaline-carbonated class, and are clear and sparkling, with an agreeably pungent taste. Their chemical composition is not unlike that of the celebrated Vichy Springs of France (Grande Grille), and their physiological action on the human economy is practically identical with that exercised by those waters. Following is Anderson's analysis: One United States gallon contains (solids): Sodium chloride, gr. 28.60; sodium carbonate, gr. 195.52; sodium sulphate, gr. 0.36; potassium chloride, gr. 0.09; magnesium carbonate, gr. 19.75; calcium carbonate, gr. 18.14; ferrous carbonate, 0.07; silica, gr. 5.92; and traces of potassium carbonate, potassium sulphate, strontium carbonate, barium carbonate, lithium carbonate, borates, arseniates, and salts of alumina. Total solids, 268.45 grains. Carbonic-acid gas, 224.75 cubic inches. Temperature of water, 93° F.

The French Vichy contains 408.95 grains per United States gallon. As an antacid, tonic, aperient, diuretic, and alterative mineral water the Ukiah Vichy ranks among the best in the country. It has proved highly beneficial in irritable states of the gastro-intestinal mucous membrane, dyspepsia, torpidity of the bowels, sluggish action of the liver, etc. Excellent results have also been observed in Bright's disease, acid states of the blood and urine, rheumatism, and gout. The waters are soon to be used commercially. There are numerous other springs on the premises, but their waters have not yet been analyzed. Good accommodations and bathing facilities are provided for visitors.

James K. Crook.

ULCER, ULCERATION.—The proper definition of the word ulcer, and exactly what limitations and restrictions should be placed on the term, have always been matters of considerable difference of opinion. Warren,[1] Curtis,[2] Tillmann,[3] and others follow with slight modifications the definition of Billroth, who defines an ulcer as "a loss of substance with no tendency to heal." Warren even goes further and says: "The term implies that the wound or granulation surface is stationary or enlarging, and that it has developed by death of the part piecemeal."

He further states: "An open granulating wound is not an ulcer, but it may become one if the granulations begin to break down and the edges begin to melt away." On the other hand, Park[4] defines an ulcer as "a surface which is or ought to be granulating," thus agreeing with Golding Bird,[5] whose definition is "a limited area of granulation tissue on the surface of the body."

Thus we have two absolutely contradictory ideas. If we accept the first definition, we must exclude all those ulcers which have begun to granulate in a healthy manner, and to which the name "healing ulcer" has been given; while if we accept the definition of Golding Bird, we leave out all those ulcers which are not granulating, such as rapidly spreading phagedenic ulcers, or those whose bases are formed by the underlying tissues (raw ulcer), or that condition known as croupous ulcer. Park, however, overcomes this difficulty by saying "is or *ought to be* granulating." Moreover, although a granulating wound cannot be distinguished pathologically from a healing ulcer, the term ulcer conveys a different impression; a definition which includes all cases would be: An ulcer is a solution of continuity or superficial loss of substance of the skin or mucous membrane which is, or has at some time been, progressively enlarging by inflammation. This definition would include all of the above-mentioned cases, and exclude healthy granulating wounds which have been the result of traumatism.

Ulceration is a word which by many authors is very loosely used. By some it is used synonymously with ulcer. Others employ the term where several ulcers exist, or where a considerable surface is the site of ulceration, as in ulceration of the rectum; but it seems better that the term should be restricted to the pathological process by which ulcers are formed, *i.e.*, a superficial molecular gangrene or disintegration of the skin or mucous membrane.

Varieties.—Since Bell,[6] as early as 1778, classified ulcers according to whether they were due to some local cause, or were symptomatic of some constitutional vice, his classification has with certain modifications been largely followed by subsequent writers. A satisfactory classification, however, is rendered difficult by the fact that there are often several etiological factors which may be present in any one case, as, for example, varicose ulcers where frequently traumatism, infection, phlebitis, periphlebitis, œdema, or eczema, either together or separately, may determine the formation or non-formation of an ulcer. Furthermore, an ulcer may be dependent on a certain poison acting in two different ways, either by primary infection or constitutionally, as in the initial lesion of syphilis and in tertiary syphilitic ulcers.

From an etiological standpoint ulcers may be divided into three great classes:

1. *Non-specific ulcers*, including all those cases not due to some particular infection or to malignant disease, but whose etiology depends on: (*a*) traumatism; (*b*) infection with some of the pyogenic or saprophytic bacteria; (*c*) interference with the circulation either of the arteries or of the veins or lymphatics; (*d*) interference with nutrition through the trophic nerves; (*e*) pressure from without as from splints, apparatus, or even the bedclothes, as in the case of bedsores; or from within as from benign tumors, gouty tophi, etc.; (*f*) skin diseases, as pemphigus, eczema, ecthyma, and herpes; (*g*) constitutional disease, as scurvy or diabetes; (*h*) the various causes of ulcers of the mucous membranes (excluding specific infection and malignant disease), as uræmia, mineral poisons, abdominal burns, etc.

2. *Specific ulcers*, including those due to: (*a*) syphilis; (*b*) tuberculosis; (*c*) typhoid; (*d*) diphtheria; (*e*) various forms of dysentery; (*f*) malaria; (*g*) glanders; (*h*) actinomycosis; (*i*) leprosy.

3. *Malignant ulcers*, among which are included superficial malignant new growths which break down and ulcerate, or deeper ones which involve and destroy the skin or mucous membrane overlying them. These malignant ulcers may follow the types of carcinoma, sarcoma, epithelioma, or rodent ulcer, being due to the breaking down of the primary growth, or an old chronic ulcer may become malignant by undergoing epitheliomatous or more rarely sarcomatous degeneration.

Besides this classification according to etiology, various names are given to ulcers depending on their condition at the time of examination. Thus we have:

1. Healing.
2. Spreading: (*a*) inflamed; (*b*) phagedenic; (*c*) sloughing.
3. Chronic: (*a*) with feeble, indolent or exuberant granulations; (*b*) with callous edges; (*c*) with a croupous base; (*d*) with a raw base. And in addition the terms fungating ulcer and scirrhous ulcer are sometimes used to describe ulcers due to malignant disease. By some authors these names depending on the condition of the ulcer are used as a basis of classification; but in reality they are only phases through which various ulcers may run during their course.

Etiology.

We have seen in considering the classification of ulcers that there may be several factors in the etiology of one of these lesions, or that one cause may act alone. The etiology may therefore best be studied by dividing it into:

1. Predisposing causes: (*a*) general; (*b*) local; and
2. Exciting causes.

1. Predisposing Causes.—(*a*) *General.—Age, Sex, Occupation, Social Condition, etc.* Age can hardly be considered as an important factor in the etiology of an ulcer, as there are so many other elements which have a more direct bearing on its causation. To be sure, old age is accompanied by retrogressive tissue changes, atheroma of the arteries, impaired circulation, etc., and one would therefore expect the statistics to show a greater proportion of ulcers during the later decades of life. But that ulcer is not relatively more frequent in the aged is probably due to the fact that such frequent causes as tuberculosis prevail in the early decades, and syphilis in early middle age, and also that traumatism in the early and middle decades is more frequent than among the aged. As regards sex, it has been shown by statistics that ulcer is three times more prevalent in men than in women. This is probably due to the fact that men are more exposed to traumatism, and that they are more likely to neglect a slight wound, which with infection becomes an ulcer. Also the greater prevalence of syphilis and alcoholism in men may in some measure explain why ulcers are more common among them than among women. Occupation seems to have little to do with the etiology of ulcer beyond the fact that it may predispose to traumatism or various forms of infection and that it may prevent cleanliness. It is in this latter element that we have one of the most important etiological factors in the causation of ulceration. The non-specific and non-malignant forms of ulcer are infinitely more common among the poorer classes, among whom lack of means or lack of intelligence, as well as untidy habits, will allow filth, and with it of course infection, to enter a wound the result of some slight abrasion, or the lesion of some skin disease; and the formation of an ulcer is the consequence.

Constitutional Disease.—Many of the constitutional diseases such as diabetes, lithæmia, scurvy, anæmia, tuberculosis, and syphilis, as well as the exhausting fevers, as typhoid, scarlatina, etc., lower the vitality of the tissues, while other conditions, such as valvular disease and fatty degeneration of the heart, general obesity, and atheroma, by preventing proper circulation predispose to the formation of ulcers when there is in addition some exciting cause.

(*b*) *Local Predisposing Causes*—1. *Interference with the Arterial Circulation.*—There may be a predisposition to ulceration as a result of embolism which cuts off the nutrition of a part, or the embolus may be infected and thus cause the formation of an abscess, which, if superficial, may result in the development of an ulcer. Atheroma of the blood-vessels, by interfering with nutrition, may also act as a local cause. Certain vaso-motor disturbances, such as occur in frost-bite, chronic ergotism, and Raynaud's disease, may produce small areas of localized gangrene, and these areas may become subsequently the seat of ulceration.

2. *Interference with the Venous Circulation. Varicose Veins.*—When œdema results from interference with the return of venous blood from a part, it is obvious that such a condition would predispose to the formation of ulcers. The exact relation of varicose veins to the formation of ulcers is, however, a matter of dispute. There are many people who have varicose veins even to a severe degree, who never suffer from ulcer; consequently we must look for some other element in the etiology. Schreider[7] tried to prove this other element to be the gouty diathesis, and he considers both the varicose veins and the ulcers to be the result of lithæmia. Quénu[8] found a neuritis secondary to the varicose veins, and considers the formation of the ulcer to be due to trophic disturbance. In this view he is upheld by Silvy.[9] On the other hand, Mr. A. Pearce Gould[10] writes of "those troublesome ulcers of the lower third of the leg nicknamed varicose." There is one condition, however, which certainly has a direct bearing on the relationship of varicose veins to ulcer, and that is