Although, in the light of our present knowledge, it would appear that the prevention of yellow fever should be a comparatively easy matter, and it has in fact been eradicated from the city of Havana, which for years was one of its principal endemic foci, a recent (1893) epidemic within the limits of the United States, at Laredo, Texas, indicates that the history of yellow fever in this country may not yet be completed. There can be no doubt, however, that the extension of this disease could be absolutely arrested if all infected individuals could be protected from the attacks of mosquitoes of the species (S. fasciata) which serves as an intermediate host for the parasite, or if all the infected mosquitoes could be promptly destroyed.

George M. Sternberg.

YELLOW FEVER: SYMPTOMATOLOGY, MORBID ANATOMY, TREATMENT.—DEFINITION.—Yellow fever is a communicable disease, traceable to populous centres of the littoral of the tropical Atlantic, and transmitted from man to man by the bite of the *Stegomyia* mosquito. The chief features of the disease are: (1) a fever of from two to seven days' duration, characterized by a sudden invasion and a fastigium of from one to four days' duration, followed by an irregular lysis which may be interrupted by a secondary exacerbation; (2) a steady fall of the pulse, commencing during the fastigium and leading to a remarkable slowing of the heart beat; (3) vomiting; (4) jaundice; (5) albuminuria; (6) a tendency to stasis of the circulation; and (7) to hemorrhages. The lesions consist of parenchymatous degenerations of the liver, kidney, and stomach.

GENERAL DESCRIPTION.—During the early hours of the morning the patient awakes with a slight rigor, and, on moving, experiences vertigo and numbness and heaviness of the lower extremities. This is followed by nausea, and in some instances by vomiting of the remains of the last meal; the temperature rises rapidly; frontal headache, rachialgia, and pains in the limbs develop, and the pulse becomes frequent. The face assumes an injected, turgid appearance; the eyes are red and moist. The patient looks like a person who has indulged in an alcoholic debauch. During the day the fever continues to rise and the patient complains further of discomfort, pain or burning in the epigastrium, with sensitiveness to pressure. The temperature rises to between 102° and 103° F. and the pulse to 100 or 110. After six or nine in the evening of the first day the temperature usually falls, remitting one or two degrees on the morning of the second day. After the initial elevation of the temperature the course of the disease may vary according to three different types: the descending or mild type, the continued type, and the remitting, complicated or secondary fever type. The vaso-motor erethism will begin to subside, together with the painful symptoms, after the diurnal elevation of temperature of the second day, and it is replaced either by the evidences of a gradual return to the normal, or by the signs of blood stasis with hemorrhages from the mucous membranes, or with the syndrome of a malignant icterus. The urine becomes albuminous on the second or third day of the disease. The mental attitude is usually one of alertness. Even when the patient is delirious the expression of the face is apt to be attentive, though the mind be utterly confused and the speech wild. In some cases there is somnolence. The pulse begins to fall on the second day, and continues to fall even though the temperature may rise. Recovery is usually rapid, and sequelæ are rare. Independently of the course of the temperature we may recognize certain types, such as the uncomplicated, the hemorrhagic, the icteric, the ataxic, and, as rarer forms, the anuric, the dystolic, and the fulminating. The various combinations of these, however, are of too frequent occurrence to give them any practical value. We shall find it of greater clinical import to study the symptoms in detail.

Duration.—The following table will give the duration of the fever in 275 carefully recorded cases:

Duration.	Recovered.	Died.	Duration.	Recovered.	Died.
Two days	2	0	Ten days	13	4
Three days	5	1	Eleven days	3	1
Four days	7	4	Twelve days	6	0
Five days	25	2	Thirteen days	6	1
Six days	39	16	Fourteen days	2	1
Seven days	56	13	Fifteen days	1	1
Eight days	27	7	Twenty days	0	1
Nine days	19	11	Twenty-three days	1	0

From the above table it will be seen that the duration of the cases that end in recovery is, in the majority of instances, seven days; and that fatal cases are more apt to terminate on the sixth day. Cases of more than ten days' duration are comparatively rare.

Temperature.—In the classical descriptions of yellow fever, dating from the period before the thermometer came into general use, we find it stated that a remission, occurring about the third day of the disease, is a prominent feature of the thermic curve of yellow fever. Some authors speak of this disease as a fever of two paroxysms separated by the so-called period of calm. If we disregard the readings of the thermometer we frequently are impressed with the accuracy of this description. As the vascular erethism of the period of invasion subsides, there is a marked change in the appearance of the patient. In grave cases there is a tendency to stasis; at the same time internal hemorrhages may be setting in. Hence the extremities become cold. Especially about the wrists we observe coolness of the surface with or without moisture. But all this does not coincide necessarily with a fall of the internal temperature. In yellow fever, as in other diseases in which definite lesions of an acute character set in during the first week, oscillations of the temperature, remissions, secondary fevers occur with more or less frequency. We are, therefore, not surprised to find that temperature charts of plague, scarlet fever, variola, and measles, resemble very closely those of yellow fever. The tropical form of malaria, in

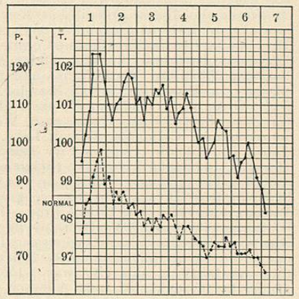

FIG. 5252.—Composite Chart of Eighty Cases of Yellow Fever, all Ending Favorably on the Seventh Day. Temperature, ——; pulse, ...

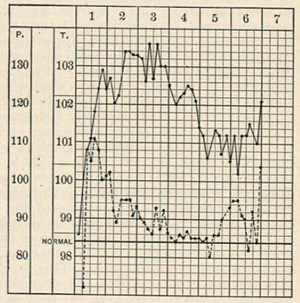

FIG. 5253.—Composite Chart of Twenty Cases of Yellow Fever, all Ending Fatally on the Sixth Day.

its primary manifestations, also frequently resembles the remitting type of yellow fever.

I have decided to present two composite charts of yellow fever. Such charts are usually of little value because the averages are obtained from cases that vary as to their intensity, their duration, and their termination. But with the large material at my disposal, I have been able to present two groups of the most common class of cases, namely, the cases terminating favorably on the seventh day, or morning of the eighth, and those terminating fatally on the sixth day (see Figs. 5252 and 5253).

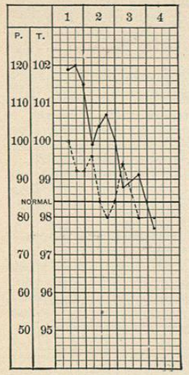

FIG. 5254.—Descending Type; Recovery.

As stated in the general description of the disease three types of thermic curve are found in yellow fever:

1st. *The Descending Type.*—It is usually mild. It is described by Finlay under the name of abortive type. It represents the inflammatory fever and the acclimating fever of creole physicians. The temperature reaches its acme on the evening of the first or second day, and descends in two, three, or four days through a down-grade series of oscillations. Occasionally such cases may end fatally on the third or fourth day without a secondary rise (see Figs. 5254 and 5255).

Remitting Type.—Usually severe. Many of the fatal cases present a secondary rise of the temperature which generally follows a depression caused by hemorrhage. The persistency of the hemorrhage may cause a second depression followed by a third rise of the temperature. Many cases of the remitting type end in recovery, and some may be quite mild (see Fig. 5256).

It will be observed in Fig. 5257 that the remission occurs during the first night of the disease. This case is one of the experimental cases inoculated by mosquitoes at Las Animas Hospital in Havana. This early remission is certainly not the remission referred to in the classical descriptions of the disease. Other observers have not had the opportunity given us by the experimental cases to study the development of the fever during the first twenty-four hours. Now, this early remission, heretofore undescribed, occurs in quite a number of cases, and is, to me, a more striking phenomenon than the later remission so much insisted upon by many authorities (see Fig. 5257).

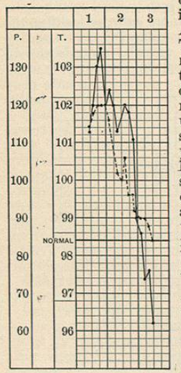

FIG. 5255.—Descending Type; Fatal on the Third Day. Suppression of urine, uræmia on the second day. Black vomit early the third day.

Continued Type.—Usually fatal. The temperature need not be very high, but it is maintained at the same level for several days with very small oscillations. The black vomit will appear late in the disease, when the fall of the temperature is well established, showing the relation that exists between the two symptoms. These cases are apt to terminate with uræmic convulsions, the amount of urine being large and of low specific gravity. The patients are restless (see Fig. 5260).

The diurnal oscillations of the temperature vary considerably, conforming in general with the normal type; the minimum is reached about 6 A.M., and the maximum between 3 and 6 P.M. A rapid rise or fall may present itself at irregular hours, but a regular *typhus inversus* is rarely met with.

The Pulse.—In the stage of invasion, and during the first and, perhaps, the second day of the disease, the pulse is similar to that of other acute febrile diseases. It is large, bounding, and frequent in proportion to the elevation of the temperature. But during the second or third day the frequency of the pulse diminishes, and may continue to drop until very slow readings are reached at the time of the defervescence. The fall of the pulse does not follow upon a corresponding fall of the temperature. The body heat, in fact, may rise or may continue at the same level while the pulse is falling. This deviation from the usual correlation between the temperature and the pulse constitutes one of the most characteristic features of the disease. The temperature and pulse charts that have been selected for this paper illustrate the point in question. Even when the general trend of the pulse line does not conform with the type I am describing, it will be noticed that at some time in the course of the disease, be it only for a few hours, a falling pulse will coincide with a rising temperature. It is quite rare to find a chart of yellow fever in which at least an occasional manifestation of this phenomenon does not show itself.

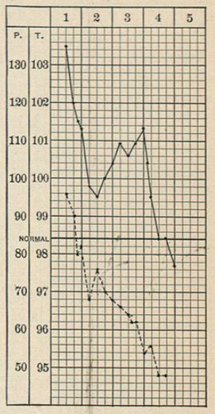

FIG. 5256.—Remitting Type; Recovery.

The pulse on the first day will rise to about 110. In the descending type of temperature the pulse will rapidly fall and may reach 45 or 50 with the defervescence. If there be a secondary rise of the temperature the pulse may be but slightly, or not at all, affected by it. In fatal cases, however, the pulse will become frequent in the last stages of the disease, and it is quite common to find under these circumstances a gradual or sudden fall of the temperature with a progressive elevation of the pulse—a symptom of very grave import.

The relatively slow heart beat in complicated cases, during the secondary rise of the temperature, may be deceptive to the inexperienced. He who has watched with apprehension the steady increase in frequency of the pulse in grave cases of pneumonia, typhoid, or the eruptive fevers, can scarcely suspect the signs of approaching

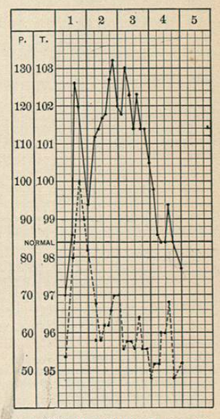

FIG. 5257.—Remitting Type; Recovery. Experimental case.

dissolution in a patient whose pulse is beating regularly and with fair volume at the rate of 70 per minute. There will be, however, a diminution of the blood pressure in such cases, with some coldness of the extremities, a cyanotic hue about the lips or of the whole surface of the body, and a sighing respiration, that should arouse our fears.

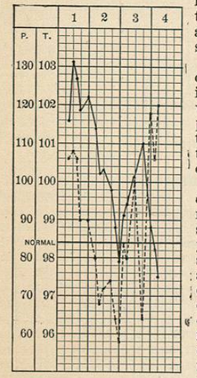

FIG. 5258.—Remitting Type; Fatal. Anuria, Jaundice.

The slow pulse may show considerable tension, specially in cases in which the icterus is well marked. The frequent pulse of the last stages in fatal cases does not differ from the preagonic pulse we find in other diseases.

The Facies.—The face is decidedly flushed, suffused with red of the same hue as that of scarlet fever. The eyes are injected and bright. There is a slight tumefaction of the lids and the lips. Even on the first day we may notice already in connection with this injection of the superficial capillaries a fleeting shade of yellow. This early manifestation of jaundice is undoubtedly the most characteristic feature of the facies of yellow fever. There is really no distinct jaundice. In the classical descriptions of the disease jaundice is not mentioned until the third day of the fever; but I hold that even at the earlier date we can detect a slight yellow tinge masked by the peripheral hyperæmia. Transient contractions of the capillaries will bring out this discoloration, for instance, in the imprints of the fingers when we pick up a fold of the skin, or in the conjunctivæ with the varying movements of the eyes. Often more distinctly at a distance than upon close inspection we notice a faint yellow glimmer pass over the eye. The same is true of the face, as may be seen when the facial muscles contract in speaking or smiling, and the redness transiently pales. Later in the disease, about the third day, these waves of color may become quite decided. The redness begins now, specially in severe cases, to assume a purplish hue; the jaundice becomes more pronounced, and the contrast between the two colors is sharper.

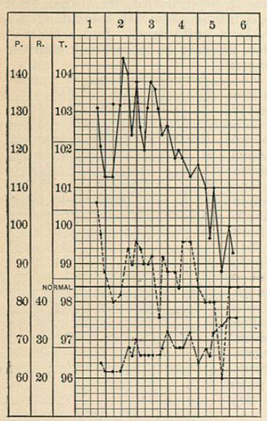

FIG. 5259.—Remitting, Irregular Type; Fatal. Albumin in the urine on the morning of second day. Gastric hemorrhage begins with the drop of the temperature on the evening of the second day, and continues abundantly to the end. Urine scanty, loaded with albumin. T., ——; P., ...; R., — · — ·—.

The features above described are, of course, more striking in the fair Northern races. It is only in connection with the darker races that we may accept the descriptive simile made by those who liken the color of the skin in yellow fever to that of mahogany.

The mental attitude and the subjective symptoms have their natural influence upon the facial expression. During the first day the eyes are frequently closed on account of the photophobia, and the expression of the face is that of pain from the cephalalgia and rachialgia. Later on, there may be somnolence, from which, however, the patient is easily aroused; but more frequently the expression is bright and alert, whether the mind be clear or not.

The mind is always clear in mild cases, and frequently also in the graver and fatal cases even to the last day.

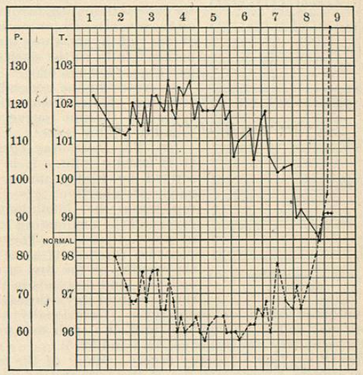

FIG. 5260.—Continued Type; Fatal. Black vomit begins at 7 P.M. on the seventh day, and is never profuse. Convulsions.

The excitement, the panic, that prevails in cities invaded by the epidemic, reflects upon the minds of the patients in the Southern States of the American Union. They are alert, watchful, suspicious as to the nature of their disease. They are apt to be nervous and excited. The Spaniard in Cuba who takes, or rather used to take, the disease as a matter of course is more calm or indifferent. All patients are apt to be rather talkative, and the dry mouth, the rather precipitate speech, reminiscent in character, are peculiar, and may be premonitory of a

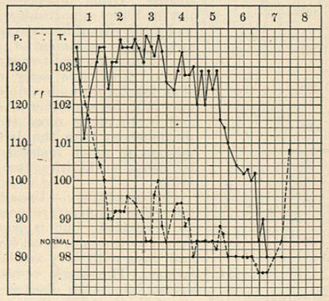

FIG. 5261.—Continued Type; Fatal. Black vomit once, at 2 P.M. of the sixth day. Delirium. Convulsions. Urine of the sixth day 1,180 c.c. with a specific gravity of 1.010. Albumin appears on the second day and is never abundant.

rather active delirium. If there be stupor it may be somnolent or wakeful, and accompanied with a staring expression. The delirium is talkative, and may be gay

or furious, generally dominated by some fixed idea; a notion that there is some urgent reason for the patient to leave his bed and quarters. His attempts to do so are, however, generally aimless, and limited to tossing about and sitting up in bed. It is very seldom that any restraint becomes necessary. Quite often there is, after the partial or complete loss of consciousness, a persistent and loud moaning which may be kept up during one or two days before death. Some cases of long duration present all the features of the typhoid state. Finally, we may have profound coma or convulsions.

Psychical disturbances, usually transient, may show themselves during the convalescence. I think they are less common than in typhoid fever and influenza.

Pains.—The supra- and intraorbital pains are perhaps the most distressing and persistent. They often disappear after the invasion, to recur with secondary elevations of the temperature or as a uræmic manifestation. The pains in the back and limbs may also be very distressing, and may even cause the patient to cry out in anguish. I have met with such severe aching only in cases of smallpox. In light attacks, however, the pains may cause little or no distress. Occasionally there are marked hyperæsthesia of the skin and deep-seated tenderness of the muscles. During convalescence it is not very rare to meet with painful neuritis, specially of the lower extremities. It usually affects one leg more than the other, and is accompanied with paræsthesia and very slight paresis. In my experience there has been only one case of serious peripheral palsy with atrophy, lasting several months and ending in recovery. Articular pains are rare. They are probably due to secondary infections, and may be accompanied with slight swelling of the joint.

The Skin.—After the first or second day the skin is apt to be moist, or at least the perspiration can be readily brought out by warm covering, or hot drinks, or other diaphoretics. Even during the first two or three days a slight moisture may alternate with a dry burning skin. When there is a marked remission it may be accompanied with a profuse perspiration, whether the defervescence be final or not; so that an active skin cannot be looked upon as a favorable sign or the indication of a critical discharge. A moist, clammy, cyanotic skin is frequently met with in grave cases after the third or fourth day of the disease.

Odor.—These perspiring patients are frequently malodorous, especially when, as is not rarely the case, a forced diaphoretic treatment is insisted upon; but I have never been able to detect in yellow fever an odor that may be called specific.

Rash; Eruptions.—The redness of the skin, previously described, is usually most marked about the face and neck, but it may be circumscribed in patches like an irregular scarlatina, an erythema, or the eruption of dengue. Rarely, faint irregular blotches may be seen, resembling the initial rash of variola. Occasionally we meet with sudamina, and very rarely with discrete pustular eruptions. An erythema and excoriations of the scrotum have been described by some authors, but I believe them to be exceptional and connected with chronic affections of the skin in these regions.

Gangrene is an extremely rare complication of the later stages, or of the period of convalescence, of yellow fever. I have seen once gangrene of one leg as the result of a secondary endocarditis. Other forms of localized gangrene about the scrotum or about the mouth are probably connected with neglect in the management of the disease.

Suppuration is, I believe, less frequently met with in yellow fever than in any other infectious disease. Abscess of the liver, suppuration of the parotids, deep-seated muscular abscesses are mentioned in the literature, but I have never encountered such complications. It is probable, therefore, that the secondary infections, evidences of which appear to exist in the clinical history, are not caused by pyogenic micro-organisms. I have suggested that the Shiga bacillus, a member of the hemorrhagic group, may be responsible for the secondary infections.

Digestive Apparatus.—The lips may be red and slightly swollen. In the later stages of the disease they will be purplish in severe cases. Herpes labialis is not common. The gums, specially of the upper jaw, are usually somewhat swollen on the second or third day, and covered with a thin creamy coating which is apt to form a faint line upon the gum at some little distance from the neck of the tooth. Later on, the gums are almost always spongy, and inclined to bleed, either spontaneously or upon pressure.

The tongue presents no symptom of interest. It carries no special coating, and may be somewhat pointed and red about the edges. In hemorrhagic cases when the hæmophilic symptoms have shown themselves, the tongue is usually pointed, smooth, crimson, and moist; it may also present bleeding cracks upon the surface. At the same time the mucous membrane of the mouth and fauces will show a similar appearance.

Exceptionally the parotids are the seat of swelling in the initial stage of the disease. This is probably due to inflammatory œdema. The tumor is rather soft, and disappears before the end of the attack. I have never seen suppuration of these glands.

The Stomach.—Vomiting is by no means a constant symptom in yellow fever. As an initial symptom I believe it to be more common in variola and scarlatina. At this stage it is merely vomiting of portions of food still remaining in the stomach, and occurs but once, at the beginning of the attack. Persistent vomiting is a grave symptom; it may continue upon the initial manifestation, or, more frequently, it will begin on the second or third day. As a rule the vomiting will cease if the stomach be given absolute rest. The vomitus, if we exclude the initial emptying of the stomach, consists of a watery, somewhat opalescent material, containing variable quantities of mucus. Later in the course of the disease, if the vomiting should persist, it is apt to become hemorrhagic, as will be shown at first by the presence of minute brownish and black specks floating on the surface; then the specks increase in size and number, the liquid becomes darker, until we have the characteristic black vomit. In these severe cases, in the intervals—which may be long or short—between the acts of vomiting, the patient is usually tormented with constant nausea, or distress and burning at the epigastrium, or hiccough, and a sensation of rawness and burning along the œsophagus. Black vomit may be absent in severe and even fatal cases, but then the black fluid will almost certainly be found in the stomach at the autopsy.

Vomiting is frequently absent in mild cases unless provoked by medication; but epigastric tenderness upon pressure is rarely absent. We should note also epigastric pulsation as a frequent symptom.

The bowels are usually sluggish, but amenable to the action of cathartics. The stools are often normal; they are not clay-colored, but in hemorrhagic cases they are frequently dark, tarry, or bloody.

The Liver.—Jaundice.—The liver is not appreciably enlarged, but may be sensitive to pressure. The lesions that will be described in connection with this organ are, in part, sufficient to account for the jaundice on the generally accepted theory of a hepatogenous origin. The areas of swollen, necrotic, dislocated hepatic cells; the round-cell infiltration of the perilobular zone could evidently, and no doubt they do, give rise to obstructions in the canalicular system; but the liver cells do not seem to be very active in the transformation of blood into bile pigment; they do not themselves become overcharged with pigment as is usually the case in obstructive jaundice. In yellow fever the liver seems to be comparatively less jaundiced than are other organs and tissues. The excess of hæmoglobin in the blood would lend support to the opinion that we have here to do with a form of polychromic icterus, but the liver cells are so generally disorganized that one cannot readily accept their ability to elaborate and transform the excess of blood pigment.

Here, more so than in connection with any other disease, it seems to me that the clinician should be loath to give up altogether argument in favor of a hæmatogenous jaundice, or at least in support of the view that something else than bilirubin may give rise to the yellow discoloration.

Jaundice is seldom, if ever, absent in yellow fever. It may be very slight, perhaps disputed, in some mild cases. Also in the rapidly fatal cases it may not show itself until after death. The dead body is always yellow in this disease.

When speaking of the facies I have mentioned a slight yellow discoloration among the initial symptoms of the disease. I believe it may be observed sometimes before the actual invasion. This symptom is first noticeable in the sclerotics. Now it is here also that the distinct jaundice of the third or fourth day of the disease first shows itself. It may be limited to this region, or more frequently it extends, growing in depth, and invading the regions that were most intensely flushed during the initial hyperæmia, until the whole body may become saffron-colored. Usually the jaundice is not so intense as it is in cases of obstructive icterus, or in Weil's disease; the color does not tend to assume a greenish hue, but is rather modified by the concomitant, more or less dusky, red, or purplish hyperæmia. The jaundice increases during two, three, or four days, and then disappears rather rapidly, leaving usually no traces by the end of convalescence. The intensity of the jaundice is not of itself a symptom of grave import, especially if it be not accompanied by a marked hemorrhagic tendency; but the early manifestation of the symptom, a well-developed jaundice, for instance, on the second day, indicates a fatal termination.

The Urine.—Quantity and Specific Gravity.—The daily averages for cases of seven days' duration, all ending in recovery, are given in the following table:

Day.	Quantity. C.c.	Specific gravity.	Day.	Quantity. C.c.	Specific gravity.
First.....	820	1.020	Fourth.....	1,206	1.018
Second.....	991	1.017	Fifth.....	826	1.019
Third.....	1,084	1.018	Sixth.....	850	1.017

The daily averages for fatal cases of six or seven days' duration are represented in the following table:

Day.	Quantity. C.c.	Specific gravity.	Day.	Quantity. C.c.	Specific gravity.
First.....	775	1.022	Fourth.....	1,220	1.013
Second.....	869	1.018	Fifth.....	892	1.013
Third.....	1,113	1.015			

In the last two days the urine is frequently lost. The specific gravity is usually low, and the amount is reduced even to absolute anuria; though the cases are by no means rare in which the quantity and density of the urine are not seriously disturbed.

In all cases, mild or grave, the amounts of urea and of the chlorides gradually diminish during the fever.

Albumin.—The presence of albumin in the urine constitutes one of the chief characteristics of this disease. If we divide the cases of about one week's duration in two groups, those ending in recovery, and those ending fatally, we shall obtain the following instructive table:

Albumin appears	Recovered, per cent.	Fatal, per cent.
On the first day in	2	33
On the second day in	44	33
On the third day in	29	33
On the fourth day in	14	
On the fifth day in	8	
On the seventh day in	2	

In the large series of cases that constitute the basis of this article, albumin was found in all. It is true that some, that were perhaps cases of yellow fever, may have been excluded precisely because of the absence of this symptom; but, if accepted, they would have been at best but doubtful cases. In none of the infectious diseases is albuminuria so frequent a symptom. I must admit, however, that the careful examination made of the urine in all kinds of fevers has shown that this symptom is met with—more frequently than is generally believed—in influenza, typhoid, and malaria. In these diseases, however, unless the infection be severe, the amount of albumin is less, or the date of its appearance later, than in yellow fever.

Urobilin is frequently found in the urine, and bile pigments in the cases in which jaundice is a prominent symptom. An abundance of the latter is looked upon by some as a favorable sign. Azevedo and Couto report that they often obtain crystals of leucin.

Hæmaturia is rare, and hæmoglobinuria I have never met with in uncomplicated cases.

Albertini has shown, and I have confirmed, that the diazo reaction is not obtained in yellow fever. Its presence may be looked upon as very strong evidence against this disease.

Casts are found in all but the very mild cases of yellow fever. They may be hyaline, granular, or epithelial. Sometimes they are found in great numbers, and one cannot help being amazed at the rapidity of their disappearance, together with the albumin, during the convalescence, or even before the fever has entirely subsided. A chronic form of parenchymatous nephritis, following upon yellow fever, is to be counted among the rarest of sequelæ.

Retention of urine is not rare, but in my experience complete suppression is an uncommon and almost always a fatal complication.

Respiration.—The breathing is not accelerated except moderately during the last twenty-four hours in fatal cases. Frequent sighing and hiccough are rarely absent in the grave cases.

The Blood.—The maintenance of a high percentage of hæmoglobin during the first three or four days of the disease was first discovered by Finlay. Albertini has made a clinical application of this fact, and we have found in a large number of cases values ranging between 90 and 105. The specific gravity of the blood is not correspondingly high. It varies, in fact, between 1,040 and 1,060. In 32 cases of yellow fever examined with this point in view, the percentage of hæmoglobin has been found below 90 in 3; 70, 75, and 82 respectively. In other diseases, such as typhoid and especially malaria, the readings are almost invariably low. We consider this sign to be of distinct diagnostic value.

The number of red blood cells is not diminished. This fact, first observed by Finlay and Delgado, has been more recently confirmed by myself and by Azevedo and Couto. The increase in the number of erythrocytes and in the amount of hæmoglobin may persist until the fifth day of the disease. The red cells show no change morphologically or in their color reaction. The number of blood plaquettes is increased.

Leucocytes.—In yellow fever we have hypoleucocytosis without any characteristic variation from the normal relations of the several kinds of leucocytes. The hypoleucocytosis gradually disappears during convalescence, and is followed by some augmentation of the number. There may be hyperleucocytosis during the preagonic period.

The relative proportion of the different kinds of leucocytes I have found to vary as follows: Polymorphonuclear from 60.50 to 79.50 per cent.; lymphocytes from 14.10 to 36.40 per cent; transition forms from 1.50 to 3 per cent.; large mononuclear from 1.78 to 9.50 per cent.

There is usually some increase of the mononuclears, but the readings are not so high as in malaria. The difference, as suggested by Gray, may be given some weight in the diagnosis, in the case of this disease. Eosinophiles are seldom found.

Hemorrhages.—Out of 277 carefully recorded cases, 122 presented hemorrhage as a noticeable symptom. Probably among the remaining 155 there were many with spongy gums that could be made to bleed slightly upon pressure. Of the non-hemorrhagic cases 148 patients recovered and 7 died; of the hemorrhagic 66 recovered and 56 died. The fatal cases had, with few exceptions, gastrorrhagia; most of them had at the same time other forms of hemorrhage. Of the patients that recovered 27 had black vomit. In most of these, however, the symptom was not pronounced; that is, the vomitus contained only more or less numerous specks of altered blood.

The character of the black vomit varies from the fluid just described, or one containing brownish flakes or striæ of a bright red color, to a black syrupy fluid. The amount varies considerably. Sometimes large quantities are repeatedly ejected with force to a considerable distance. In fifty-two per cent. of the cases the first manifestations of black vomit present themselves about the fourth and fifth days. I have seen it as early as the second and as late as the eleventh day. There can be no doubt as to the nature of the dark fluid under consideration. The microscopic, chemical, and spectroscopic investigations show the presence of variable quantities of altered blood.

Bleeding of the gums and nosebleed are the most common forms of hemorrhage in yellow fever. Black vomit follows in frequency; but we should not forget that it is not always an evidence of gastrorrhagia, since the blood may have been swallowed from the mouth or nasal cavities. Melæna frequently occurs as a result of the hemorrhages above described, or from enterorrhagia.

Bleeding from the uterus and rectum, petechiæ, cutaneous hemorrhages are all quite frequent. Minute hemorrhages and more or less extensive ecchymoses are found in the internal organs post mortem.

As an explanation of these hemorrhages I have suggested the possibility of secondary infections with bacteria of the hemorrhagic group. I have once had the opportunity of testing the blood serum of a hemorrhagic case with a culture of the Shiga bacillus, and I found a positive agglutination with dilutions of 1 to 50. It is well known that the blood of yellow-fever patients will agglutinate at times the Zanarelli bacillus, and that the latter may be found in the tissues.

The hemorrhages usually occur with a falling temperature, and it does not seem quite clear that the fall is a consequence of the loss of blood. I rather incline to the view that both phenomena have a common cause.

Complications.—If we exclude the accidents that may occur in the course of the disease, and that have been already described, we may say that complications are quite rare. Pulmonary and cardiac inflammations are very infrequent. The authors of the excellent monograph in Nothnagel's "Specielle Pathologie," Azevedo and Couto, believe that endocarditis is a common complication, but such has not been my experience, nor that of American and Cuban observers.

Malaria is not a very rare complication. Its symptoms usually remain in abeyance for three or four days, and then resume their periodic character. The complication is a serious one, but by no means necessarily fatal.

Relapses.—Relapses are very rare. Accidents may occur in the course of a slow defervescence, giving rise to renewed fever; but a second attack, interrupting the course of convalescence, I have seen but once in carefully observed cases. I also have the records of a second attack occurring six weeks after complete recovery from the first. Both attacks were severe.

Termination.—The return to health is usually rapid. In the second week the patient clamors for food, and is anxious to resume his avocations. In severe cases the favorable result may be delayed by prostration, anæmia, impaired digestion with or without jaundice, paresis of the extremities, neuritis. Death results, in the majority of cases, apparently from intoxication affecting the nerve centres and from hemorrhage. Ataxic symptoms, delirium, convulsions, coma, crowd one another in the last hours of fatal cases of short duration. Other cases, usually with intense jaundice, have a less violent end, and die in an adynamic condition by asthenia.

Diagnosis.—The diagnosis rests mainly upon the four chief symptoms: the facies, the pulse and temperature, the albuminuria, and the tendency to hemorrhages.

In certain diseases, usually benign, such as influenza and dengue, that may be confounded with mild cases of yellow fever, the diagnosis is at times difficult. At the beginning of an epidemic the examination of several patients may be necessary.

In influenza we should expect to find the catarrhal symptoms, the peculiar appearance of the buccal mucous membrane and the tongue, the greater remissions of the fever, the pulmonary complications, the presence of the influenza bacillus. In yellow fever, on the other hand, we should find jaundice and albuminuria much more frequently than in influenza of the mild type that we are here concerned with; and then, besides, in yellow fever there is the peculiar pulse line.

In dengue we would rely upon the eruption and the articular and muscular pains, and upon the absence of jaundice and albuminuria.

With respect to graver forms of yellow fever it may be difficult to determine whether we are dealing with this disease or with typhoid, malaria, and malignant forms of jaundice, or, more rarely, with plague and relapsing fever.

Typhoid Fever.—Each one of the two diseases—yellow fever and typhoid fever—has its special facies. During the first week, when the mistake is likely to be made, the tongue in typhoid is heavily coated. The temperature is more regular, and the pulse frequency does not decrease. I need not mention other symptoms generally found in typhoid; but our opinion will be guided by the following facts: In typhoid our patient has probably been sick with fever two or three days; he is likely to have a temperature of 103° F. or thereabout. The following day he will have the same temperature. Now in yellow fever this would mean a quite severe form of the disease, and the patient ought to have a well-marked albuminuria. In typhoid he will have but little or no albumin. This may appear as a matter of little importance, a mere difference in degree, but it is not so. The pronounced albuminuria of severe cases of yellow fever is a very striking symptom, quite distinct from mere febrile albuminuria. The albumin may increase in typhoid, but a case of yellow fever with the temperature of a typhoid patient, kept up for several days, would be in a very grave state, and would show all the alarming and peculiar symptoms of the former disease. Besides, in typhoid we should have the diazo reaction in the urine, and a low percentage of hæmoglobin in the blood. At the time when the Widal reaction is obtainable the case is not likely to be mistaken for one of yellow fever.

Malaria.—The plasmodium in the blood in malaria, and the albuminuria of yellow fever are the main distinctive features. A great deal has been written about a certain form of malaria as likely to be confounded with yellow fever; I refer to the bilious remittent fever. I suspect that this name was generally given to the yellow fever of the natives of the yellow-fever zone who were supposed to enjoy immunity against this disease, or else it is a form of malaria that has disappeared from our malarial regions.

The real difficulty in diagnosis is encountered in connection with cases of æstivo-autumnal fever during the first days of the attack, and with cases of yellow fever in the first stage of the disease. It is precisely the absence of the so-called bilious symptoms at this time in the latter disease that renders the diagnosis difficult. We may have to wait for their appearance, as they are sure to come in a case of yellow fever having the high temperature and the stormy onset of the tropical form of malaria in an unacclimated person. The same may be said of the albuminuria; it will be a striking symptom of such a case, whereas in malaria, if present at all, it will be no more than an ordinary febrile manifestation. In