DISINFECTION

IN

YELLOW FEVER,

AS PRACTISED

AT NEW ORLEANS,

IN THE

YEARS 1870 TO 1875 INCLUSIVE.

BY

C. B. WHITE, M. D.

SUBMITTED TO THE

American Public Health Association at Boston,

OCTOBER, 1876.

NEW ORLEANS:

JOHN W. MADDEN, PRINTER, 73 CAMP STREET.

1876.

DISINFECTION

IN

YELLOW FEVER,

AS PRACTISED

AT NEW ORLEANS,

IN THE

YEARS 1870 TO 1875 INCLUSIVE.

BY

C. B. WHITE, M. D.

SUBMITTED TO THE

American Public Health Association at Boston,

OCTOBER, 1876.

NEW ORLEANS:

JOHN W. MADDEN, PRINTER, 73 CAMP STREET,

1876.

DISINFECTION IN YELLOW FEVER,

AS PRACTISED AT NEW ORLEANS IN THE YEARS 1870 TO 1876, INCLUSIVE.

The marked localization and the very limited range of action of the cause of yellow fever are universally recognized facts.

Wilson, quoted by LaRoche, writing of the epidemic on the "Rattlesnake," states that these characteristics of yellow fever poison were "most strikingly exemplified in the berths of the midshipmen and officers of that class. They were placed exactly opposite to each other, with the pumps at equal distances between them. One gentleman was afflicted in the starboard berths, while every member of the larboard berths was laid up nearly at the same time."

In 1822, the Board of Health of New York ascertained that the yellow fever epidemic of that year spread at the rate of forty feet per day.

Dr. Nott says of the Mobile epidemic of 1842 and 1843: "In 1842 the epidemic began in the southern part of the city, in Spanish Alley, and swept one-half of the city, stopping at Dauphin street. The next year it began in the northern portion of the town, finished the remaining portion of the city to Dauphin street, and again paused.

During the prevalence of yellow fever in the year 1856, on Governor's Island, New York harbor, in Rotten Row, an oblong rectangular building, divided longitudinally by a thin board partition, those living in the south-southwest half of the building suffered most severely, scarcely one escaping, while perfect immunity from the disease prevailed among those living on the north-northeast side. The history of yellow fever affords numerous similar examples.

Reasoning from the method and range of action and mode of propagation of yellow fever, its poisonous cause is evidently not gaseous in its nature. It seems to attach itself to the soil, to walls, and probably surfaces in general. If this poisonous cause be organisms, either animal or vegetable, they seem to be lowlying, propagating from centers along surfaces equally in all directions, against the wind as well as in the direction of air currents. It is also evident that the cause must antedate the effect, that the yellow fever poison exists in activity some days before the moment of the attack of sickness, as the period of incubation is in most persons four days. It is evident, also, that the poison must have existed in more or less force for an indefinite period preceding the moment at which the incubation of the disease began.

It is also evident that at the date of the appearance of the case of disease, the poisonous cause is probably no longer confined to the limits of the habitation or locality where the disease was contracted, but has extended to greater or less distance into the space around it.

To completely destroy the poisonous cause, and thus arrest the spread of the disease, disinfection must both in theory and practice be applied to every infected portion of the entire suspected locality. It must, so to speak, be applied to sound surfaces, to a region beyond that where the poison is suspected to exist, in order to certainly prevent the spread of the disease.

To approximately define the area to be disinfected, to the number of days the person has been sick is added four as the probable number of days of incubation of the disease. This total multiplied by forty, the rate of travel per day in feet which observation has furnished, is the radius in feet of the probably or possibly infected area. If, for example, the case has existed four days, from this case taken as a centre, a circle of 320 feet radius is to be considered and treated as infected.

Disinfection is effected in dwellings and similar structures by sprinkling floors with carbolic acid, one part to fifty of water, wetting bedding, clothing, etc., thoroughly with the same solution, or by placing them in boiling water. Walls and ceilings are

disinfected by a steam atomizer, throwing a spray of diluted acid. When, owing to pressure of work, sufficient time cannot be afforded to proceed in this manner, sulphurous acid and chlorine are used. Sufficient humidity is always present in the atmosphere of New Orleans to render chlorine an exceedingly effective disinfectant. All open spaces about infected premises, yards, alleys, walks and the part of walls next the ground are freely sprinkled with carbolic acid.

The acid used has been, first, crude carbolic acid, manufactured in New Orleans, containing, according to analyses by Dr. A. W. Perry, never less than eighteen per cent., and usually twenty to twenty-four per cent. of carbolic and cresylic acids, and quite ill-smelling from the presence of napthaline and tar oils. Second, Calvert's No. 5 acid, a mixture of carbolic and cresylic acids, the latter predominating, but free from tar oils, and therefore frequently termed pure acid. The acids free from tar oils are much less unpleasant to the residents of localities in process of disinfection, but it is highly probable that the crude acid containing empyreumatic acids more energetically disinfectant than the carbolic or cresylic, and also oily and other substances, preventing the immediate evaporation of the acids, is the more permanent and efficient disinfectant.

Disinfection of infected localities by the coal tar acids may be conceived of as effected, if the cause of the disease be organisms, by their destruction by the coagulation of their albumen, or to other deleterious influence exerted on their life or reproduction; or otherwise, that the application of the disinfectant effects a thorough and complete modification of the local disease—causing conditions, (perhaps the presence of potential or catalytic albumen), which modification by destroying the cause of the disease, or perhaps only preventing its further evolution, brings back such infected locality to its usual state, one practically identical with that of its immediate vicinity where yellow fever has not appeared. Atmospheric disinfection is not proposed, the agent must be brought in contact with the poison, or poison producing, or retaining surfaces, *in loco.*

It is evident that even with cordial coöperation on the

part of the householder, disinfection cannot be effected with absolute perfection in an inhabited square. The disinfectant is therefore in addition to its application to the immediate locality, distributed upon the surface of the streets, both roadway and banquette (sidewalk), at a distance supposed to be entirely beyond the presence of the yellow fever poison, and in such manner as to encircle the fever centre by broad, continuously disinfected surfaces. This is repeated at short intervals to preclude, if possible, the passage of the poison across the belt thus laid down. Thorough, complete local disinfection is then effected in every direction toward the centre of the region thus circumscribed. The impossibility of complete disinfection of all surfaces in infected localities, under houses, etc., being evident, the expression "thoroughly disinfected" is therefore only relative, denoting the nearest attainable approximation to perfect disinfection.

It results from the impossibility of securing absolute perfection of practical disinfection, that total and immediate annihilation of the yellow fever poison is not usually secured, nor can it be expected. Its multiplication or increase, however, is hindered, its force abated, and its march impeded. It is easy to understand that if the cause of the disease be present by importation, or otherwise, very early in the season at numerous points, and all climatic influences be favorable to its life and progress, that a general epidemic may occur in spite of disinfection. It may also be anticipated that if yellow fever foci appear somewhat late in the summer, and at comparatively few points, that the practice of disinfection will delay the spread of the disease until a decided fall of temperature, and subsequent continuous cool weather stop its progress and end its existence.

In connection with this part of the subject, the quarantine system in existence in Louisiana may with propriety be briefly considered.

A quarantine system resolves itself into detention and disinfection. It is evident that in New Orleans, whose mean temperature for the months of June, July, August and September, in the years 1873, '74, and '75, was 82.51 degrees Fahrenheit

detention merely, save for a period practically inhibitory of commerce, is useless. Favorable results of quarantine may with fairness be attributed to the measures of disinfection practiced.

In general, it may be stated that in the twenty-two years, 1855 to 1876 inclusive, in which the quarantine system and Board of Health have been in existence, three epidemics have occurred, the first of which was during 1855, the year of the establishment of quarantine, while in the twenty-two years previous to 1855 there were thirteen epidemics, and in the twenty-two years previous to 1833 occurred other thirteen epidemics.

The yellow fever of certain of these epidemic years is known to have been introduced from abroad in spite of quarantine restrictions, and since disinfection has been practiced in this city with system and persistence, the disease combatted is certainly known to have, in some instances, been imported. But in 1874 Dr. A. W. Perry introduced at the quarantine station his process of disinfecting vessels by forcing into their holds for several consecutive hours, by a "power" blower, sulphurous acid gas. Synchronously disinfection of forecastle, bilges, etc., was effected by the plentiful use of the coal tar acids.

In 1875 and 1876 the additional precaution has been taken to redisinfect all vessels from the tropics after being laid to their wharves in the city, and upon the discharge of their cargo.

Hygienic rules for the government of ships on their way from tropical ports were issued in 1875, thus securing, in those obeying them, a practical "in transitu" quarantine. As conformity to these regulations shortened the period of detention at the quarantine station, certain regular traders observed them with some degree of care. In no vessel so treated has a case of yellow fever appeared during its stay in the city. These results seem to furnish evidence in favor of the efficiency of disinfection in yellow fever.

In 1870, yellow fever appeared late in August, spread rapidly, and was of malignant type, the mortality being estimated as one-third of those attacked. The late Dr. F. B. Albers, sani-

tary inspector of that portion of the city, where the disease appeared, a man of intelligence, very considerable information, much energy and executive ability, carried out disinfection as then understood very thoroughly. The report of Mr. Crookes on the use of carbolic acid in the cattle plague, suggested its use in yellow fever.

Number 230 Chartres street is a tenement house, running through the block, contains thirty rooms, and at that date was occupied by thirty families, numbering 183 persons, natives of Italy. Of these

44 took the fever;

4 sent to hospital, result not known;

14 died;

26 recovered.

Of the remaining 139, ninety-two were known to be unacclimated. After the process of fumigation and disinfection only two persons were attacked by the fever. The results in this case seeming unmistakable, disinfection was effected with still more energy and system, and the epidemic remained local, though a second focus of some magnitude appeared in another part of the city.

In Mobile, where yellow fever made its appearance the same year, and one month later than in New Orleans, and where no disinfection was attempted, the disease became a general epidemic and swept over every portion of the city. Although the disinfection of 1870 seemed of great value and lessened the ravages of the disease, it was only subsequent to this and yet later experience, and reflection upon the whole subject, that the author of this paper arrived at the principles upon which disinfection has latterly been practiced.

In 1871 one case of yellow fever appeared in New Orleans in July, two cases in August, and in the first days of September the disease developed in an epidemic form in the Fourth Municipal District. The spread of the disease was combatted by disinfectants and limited to a small portion of that district Foci appeared in other parts of the city; immediate use of disinfectants was made, and the disease spread from none of them.

The yellow fever of this year was doubtless imported. Jackson, Natchez, Vicksburg, and several other towns and villages suffered the same year from yellow fever, supposed to have been originally brought from Charleston, S. C. In every town and village where this disease appeared at all in 1871, and where disinfection was not resorted to, it became epidemic. The total number of deaths of this disease in New Orleans, in a population of 197,000, was forty-five.

The fever of 1872 appeared on the 28th of August, upon the outskirts of the locality infected the previous year. Disinfection was put in force and apparently by its agency the disease was confined to narrow limits and a total of eighty-three cases.

The history of the yellow fever of 1873 and the efforts made to control its progress are especially interesting, as the theory of disinfection was better understood, the process effected more systematically and completely, and the prevalence of the disease here, as far north as Memphis, also at Shreveport, and numerous points in Texas, showed that all the conditions favorable to the existence and spread of yellow fever existed throughout the Southwest. There is good reason to believe, as the first case of yellow fever occurred on the Valparaiso from Havana, that this vessel brought the disease to New Orleans and was the source of the epidemic, which appeared in the immediate vicinity of the wharf where she lay.

Disinfection of this locality, streets, squares, etc., was begun hesitatingly, and it was only when the disease had evidently spread to some distance, that energetic, systematic and unsparing use of disinfectants began.

From this focus or subsequent to its appearance, foci developed in six of the seven municipal districts of the city, and in each of these in an epidemic form.

In every instance the disease was confined to narrow limits, apparently stopped in its progress, and if not utterly destroyed in the infected locality, its ravages greatly diminished. In the First, Second and Third Districts of the city, cases occurred in sixty-one squares, and in eight of these, cases occurred subsequent to disinfection. In two of the eight the failure is

known to have been only apparent, the disease having been contracted elsewhere or previous to disinfection. In the Fourth District, where the fever first appeared, twenty whole squares were disinfected; subsequent cases upon five. Twenty-five half squares disinfected, in five of which appeared subsequent cases, ten in number. As fever is not necessarily contracted where the person lies ill, but may have been caused by exposure in another unhealthy locality, it is not impossible that many or most of the instances given as failures may be only seemingly so, owing to the impracticability of ascertaining the true origin of the disease.

Total population of 59 infected squares	6,846
Liable to yellow fever	1,744
Total cases of yellow fever	107
Persons attacked by yellow fever before disinfection	95
After disinfection	12

In the Fifth Municipal District, thirty-four cases occurred on thirteen blocks. In eight squares no cases occurred after disinfection. In four of the five other squares which had been only partially disinfected, cases occurred on undisinfected premises, only one square a failure; a case occurring upon this block twenty days after disinfection, which may have been contracted elsewhere, or on the germ theory, the poison may have been reproduced by the multiplication of the organisms which escaped destruction by the disinfecting agents.

At the breaking out of the disease in this district, the roadway of the streets bounding a portion of it, about four squares by seven, was liberally sprinkled with crude carbolic acid by street sprinklers. Cases of the disease occurred on eleven of the twenty-six squares included, but none originated outside of this locality in this district, (Algiers, on the west bank of the river).

Total population of this included area 1352; liable to yellow fever 226; cases of the disease 26.

In the Sixth Municipal District, cases on twelve squares, one a seemingly partial failure of disinfection.

The total population of all the squares in which yellow fever

appeared was 17,614, persons liable to yellow fever 4237, total number of cases 388.

As each fever focus was widely separated from every other, the experience of 1873, is actually six independent experiments.

It is to be considered that this disinfection was largely made during the first days of September, at which date the disease was at its height in Shreveport, was rapidly nearing its maximum in Memphis, and subsequent to which date the disease appeared and ran its course as an epidemic in many towns of Louisiana and Texas. It is evident that the general epidemic tendency of the year, if there be such a thing, had not yet passed away. Pensacola and Montgomery also suffered with epidemics of yellow fever in 1873.

It is manifest from the census of population taken, that the failure of yellow fever to spread did not arise from lack of human material upon which to exercise its malignant energies.

Galveston escaped an epidemic in 1873. The late Dr. George W. Peete was familiar with the New Orleans system of disinfection and approved it. In 1873 he carried it into effect at Galveston, and in an unofficial letter, he says of the result: "In this city there were twenty-eight or twenty-nine cases of yellow fever that I know of, and perhaps a few that I had no clue to.

After the results of isolation and disinfection in the first four cases had fortified my belief that its dissemination could be controlled, I gave myself but little solicitude, and made no attempt to obstruct intercourse with interior localities infected from Shreveport, where it was prevalent. Hence, most of the cases, seventeen of them, were clearly traceable to this source, that is, they were introduced from the interior towns of Texas, where the disease prevailed."

The yellow fever of Memphis in 1873, was derived from New Orleans. The disinfection there need only be mentioned. I quote from an informal letter of Dr. Erskine, President of the Board of Health of Memphis. "I did not enter upon duty as President of the Board of Health until the 10th of October. The disease had then prevailed more than three weeks as an epidemic. Carbolic acid had not been used up to that time.

We commenced the use of it about the middle of October—were unable to obtain carbolic acid sooner. By that time the disease had extended all over the city. I do not think we had a fair trial of it; in fact, we used it, comparatively speaking, very little. I should like to see it tried more thoroughly." The fact that water extinguishes fire is not invalidated if a city on fire at a hundred points be totally burned.

The experience of New Orleans in 1873, both positive and as compared with that of numerous other communities where disinfection was not used, is therefore decidedly favorable to disinfection.

In 1874 a few cases of fever appeared, disinfection was energetically practiced and with apparent good results. Pensacola and Pascagoula, where no sanitary precautions were used, had yellow fever epidemically that year.

In 1875 six foci of infection appeared. In the first, which made its appearance in the Second Municipal District, owing to misapprehension of instructions, the concealment of the second case, and opposition from the inhabitants of the locality caused by the ignorant prejudice of certain physicians, disinfection was not effected sufficiently early, nor to sufficient extent, nor with continuous completeness, yet the disease, by roadway and banquette (sidewalk), and such other disinfection as could be effected, was almost entirely confined to an area of four squares by five, and to a total of forty-one cases. In other foci disinfection was carried out according to theory, and the immediate cessation of the disease followed the procedure.

In the Fourth District, early in September, seventeen cases appeared in two areas near to each other, somewhat suddenly and almost simultaneously. Here no opposition existed, houses were gladly thrown open to disinfection, and although six hundred unacclimated persons resided in the infected areas, the cessation of the fever was total and immediate.

In contrast with New Orleans experience of 1875, Pascagoula recognized her first yellow fever death August 4, only eight days before the first death in New Orleans. The total number of cases in the main epidemic centre of New Orleans

was less than fifty, only four of which took place in November, whilst hundreds of cases occurred at Pascagoula; the disease prevailed at Scranton near Pascagoula, spread to Moss Point and Fowl River, and lasted throughout December. The latest known death by the disease occurred at Moss Point, January 3, 1876.

During the present year, 1876, the first case of yellow fever, probably of domestic origin, appeared August 11. Disinfection was promptly and thoroughly made, and to this date, September 30, no subsequent case has appeared in that locality. On the 1st of September and on the 8th of September a case appeared at other localities, and the whole premises where they occurred were promptly disinfected. No subsequent cases upon them.

On the 5th of September, however, in the Fourth District three cases appeared near each other. No disinfection whatever was practised in these cases. On the 13th, a case, followed quickly by others, appeared in a religious house, numbering not less than two hundred inmates, none of whom had had yellow fever. Immediate and thorough disinfection was therefore effected and twice repeated. No case of yellow fever has arisen in the institution since the disinfection.

The first sixteen cases in this Fourth District focus occurred upon twelve premises. In seven of these no disinfection whatever was practised; in one, the religious house mentioned, the local disinfection was thorough and effective. In the remaining four, disinfection of the antique type was used, merely that of the room, clothing and bedding of the patient, at most limited to the original premises; as wise a proceeding as if the efforts to control a fire in a densely built town should be limited to extinguishing the already nearly consumed building, or to diligently wetting its ashes, but applying no water whatever to its heated and already smoking neighbors.

Another focus of much less magnitude made its appearance in the First District, but as the statistics in reference to it are not sufficiently reliable for scientific consideration, it need only be mentioned.

About the 20th of September general alarm was created by the spread and malignancy of the fever, and the health authorities, yielding to the pressure of public opinion, soon after began disinfection and carried it on vigorously on the principle and according to the plan laid down at the commencement of this paper. Immediately thereafter the number of new cases diminished, the disease ceased to spread, and at this date, September 30, is practically ended. It is probable that the prevalence of dry cold winds during the last days of September was of much value in restoring good public health.

The experiment of 1876, though an eminently expensive one to the community, may be considered equally satisfactory in a scientific point of view, and may afford ultimate and permanent results to the community far outweighing its present losses.

Early in January, 1876, Hon. G. W. R. Bayley, a member of the Board of Health and of the Chamber of Commerce of New Orleans, submitted to the latter body, in an able and exhaustive communication, the evidence of the value of the system of disinfection set forth in the present paper. He maintained as a consequence of the successful sanitary results of disinfection, that quarantine restrictions upon commerce could, with safety to the public health, be now essentially modified.

The Chamber of Commerce, convinced by the evidence and reasoning offered, endorsed the proposed modifications of quarantine law. By the united influence of that body and the Board of Health, the desired legislation was secured, and detention at the Quarantine has this year, 1876, for the first time been reduced to merely that required for disinfection. As has been before stated, the practice of repeating such disinfection after arrival in the city has been carried out this year, and on board the many vessels which have arrived from tropical ports at the wharves of New Orleans, not a case of yellow fever has appeared.

The evidence positive and comparative may be briefly stated: During the years 1870 to 1876, with the exceptions heretofore noted, the system of disinfection has been persistently and

systematically followed up in New Orleans, and improved as experience from year to year suggested. During the same period, while New Orleans has escaped general epidemic, yellow fever has prevailed epidemically and devastatingly, and in some of the localities more than once, at Mobile, Key West, Pensacola, Barrancas, Powell's Point, Fowl River, Scranton, Pascagoula, Moss Point, Jackson, Canton, Natchez, Vicksburg, Montgomery, Shreveport, Memphis, various places on Red River, and at not less than fifteen points in Texas, spreading from Shreveport, where disinfection was not adopted.

The facts as at present understood give a result in favor of the control of yellow fever by the coal tar acids.

If it be finally established that yellow fever can be controlled by the agents hitherto used, substantial progress has been made, and experiment may with safety and propriety be undertaken to secure similar results by other means more effective, or of less cost, or of more easy application or less unpleasant to the senses.

The experiment has latterly been conducted in as strict accordance with scientific method as is practicable with the means and intelligence engaged. To facilitate investigation maps were prepared, exhibiting at a glance the locality and date of appearance of all cases of the disease, and date and amount of disinfection of all premises. The real and apparent relation of cases to previous or subsequent ones, and the actual or seeming efficacy or inefficacy of disinfection, were carefully considered and the results recorded.

Great as are the difficulties which surround the experiment, if the process be continued sufficiently long, and in a scientific method, a result conformable to truth will be reached. In a series of observations conducted on correct principles, honestly made and recorded, the tendency is to eliminate errors, bring truth into prominence and develop law.

In further continuing this experiment, those who have hitherto conducted it, claim that no adverse decision be rendered till the precise theory and mode of disinfection herein an-

nounced have been tried, methodically, minutely, patiently and repeatedly. Results may be but seemingly good or bad. Failures, as well as successes, may be only coincidences.