it would seem, at first view, that the increased rapidity of travel would also disseminate more rapidly the scourges; and yet it has seemed to me the practical working is the reverse. Those familiar with the history of cholera among the Mohammedan pilgrims are aware that since the abolition of caravans, and the transportation of pilgrims by steamers, very many fewer cases of cholera occur at Mecca, and along the land route from Dejeddah. It is because all are kept, so to speak, in a certain lane, where they are under constant observation; their food and hygienic surroundings are more carefully regulated; and cases occurring can be promptly treated and guarded. The same is true of steamers bringing emigrants to this country. With competent medical officers, isolated hospitals, absolute cleanliness of attendants, and prompt disinfection of discharges, the disease should be limited to those who had contracted it before coming on board, and virtually suppressed by the time of their arrival at any one of our seaports.

This influence of steam-communication is more striking, though in a different way, with reference to yellow-fever. In the great majority of cases, the vessel is the means of transportation; and the particular place of preference for the poison is, as stated above, in the filth which accumulates in the bilge. In sugar and milado carrying vessels, this, in a tropical climate, soon develops fermentative action. Until within a few years, the commercial history of vessels trading with yellow-fever ports has been as follows: A European cargo is taken to Havana, discharged, and the vessel lies an indefinite time empty in an infected port, seeking a charter for some seaport in the United States. No particular precautions of cleanliness are taken, either as regards the vessel or the crew. In most cases the fever appears while lying in port. A cargo is at length obtained, which adds to the filth of the bilge already infected. A better nidus for the propagation of the poison could not be formed; and under a tropical sun, sealed hatches, and stagnant air, it intensifies with great rapidity. An experience of several years showed that the majority of cases brought to the port of New York were on vessels of this character. Within the past ten years a radical change has been going on, and steam-transportation has largely replaced sailing-vessels, and with it there has been a large diminution in the number of the cases of yellow-fever. Steamers belong to regular lines, which make frequent and regular trips, remain but a short time in port, and are therefore rarely infected. Being of iron, their construction enables one to reach the bilge with facility, while the steam-pump flushing it keeps it clean: there is no wood to saturate and become infected. A steamer, too, carries the cargo of several sailing-vessels, and lessens the risk in that proportion. So far, then, from the rapidity of steamers facilitating the spread of cholera and yellow-fever, they have been the means indirectly of retarding both.

It could also be easily shown that the long antagonism between commerce and quarantine has entirely passed away. Instead of vessels riding an indefinite quarantine, our knowledge of the natural history of the two diseases tells us that the sooner a vessel is emptied, the less the danger of transmission of disease. Vessels, therefore, in quarantine, are returned to commerce sooner than if they went to dock, and discharged through the usual routine.

S. OAKLEY VANDERPOEL, M.D., LL.D.,
Professor of hygiene, medical department, University of the city of New York.

HOW TO DEAL WITH YELLOW-FEVER.

IN closing a report on the yellow-fever epidemic of 1873, made in response to a resolution of the U. S. senate, the present writer used the following language: —

"It may finally be added, that, in the absence of other adequate cause, the gradual narrowing of the yellow-fever zone in the United States during the past fifty years — say, from the time when leases in New-York City frequently contained a provision for reducing the rate of rents in the event of a depression of business from the advent of cholera or yellow-fever — may be fairly claimed for the sanitarian and his efforts; and that in such efforts lies all there is of promise for the future in dealing with yellow-fever."

This was written before the brilliant results of the investigations of Pasteur and Koch had opened up the tempting field which Ferrán and Domingos Freire already claim to be successfully cultivating. It may be that these gentlemen have actually accomplished — the one for cholera, and the other for yellow-fever — what Jenner, Pasteur, and Koch have done for other diseases; and although this is not yet proven, and, in the nature of the case, will require considerable time to demonstrate, there is scientific ground for believing that immunity against these pestilences will eventually be secured through a process analogous to that by which vaccination has disarmed small-pox of its terrors. Until that desideratum is reached, however, the precautions which should be taken to provide against yellow-fever will

continue to be those indicated in the sentence above quoted.

Whatever the yellow-fever poison may ultimately prove to be, enough is already known of its characteristics and limitations to enable us to formulate specific measures of such precaution. For practical purposes, we are not concerned with the many theories regarding its origin, — whether it was first engendered during the horrors of the 'middle passage' in the hold of an African slaver, or in the putrefaction of the abundant marine life of the Sargossa Sea, or by the action of atmospheric forces peculiar to the equatorial Atlantic, or by the spontaneous development of a specific organism. It is sufficient to know that there is such a poison, and, 1°, that while it does not originate in this country, it may be conveyed from place to place; 2°, that it is a poison of considerable specific gravity, infecting the lowest stratum of the atmosphere, and possesses great tenacity, clinging to surfaces; 3°, that it flourishes amidst filth, under certain conditions of temperature and moisture; and, 4°, that the disease which it produces is essentially one of cities and crowded populations.

Upon these characteristics must be based the precautions to be enforced, and first with regard to communication with places where the disease is endemic. A quarantine of absolute exclusion is demonstrably impracticable, owing mainly to the many facilities which steam enables commerce to command. Much, however, may be done in this direction by a quarantine of inspection and sanitation. To this end it is necessary, that, within the geographical limits where yellow-fever may become epidemic in the United States, a system of sanitary supervision over personal and commercial intercourse with places where the disease exists endemically be established and maintained during the season when the atmospheric conditions necessary to its epidemic spread obtain in this country. This would dictate specifically that such supervision over commerce with South-American ports lying north of 22° south, with the West Indies and the Bahamas, and with the east coast of Mexico, should begin in April at the Gulf and South-Atlantic ports, and in May at ports north of 32° or 33° north, and should continue until the close of October and September respectively.[1]

[1] Of a hundred and seventy-four epidemics, of which the date of beginning has been accurately recorded, three began in May in places south of latitude 33° north, but none earlier than June in places north of Charleston (32° 46′ north): four began as late as October in the former, but none later than September in the latter. Hence south of Charleston the danger season begins in April, and ends in October: north of Charleston it begins in May, and ends in September.

The supervision should consist of an inspection of every vessel arriving from the region specified, and of treatment, which will vary, 1°, with the actual sanitary condition of the vessel, her cargo, belongings, and *personnel*, including in the sanitary condition the facts as to age, material, and previous yellow-fever history; 2°, with the sanitary status of the port of departure; and, 3°, with the climatic and other conditions of the port of arrival. Within the limits assigned to this paper, it is not possible to enter into the details of this treatment. They are well understood by practical sanitarians, and their sufficiency has been demonstrated by the inspection services of the National board of health and the Sanitary council of the Mississippi valley, as well as in the quarantine practice of the port of New York and elsewhere; while a practical test of their value for the protection of the port of New Orleans is now being made by the Louisiana state board of health. The characteristics of the poison, as set forth in the second and third propositions, will indicate what methods of treatment by disinfection and cleansing are necessary.[1]

But no matter how perfect such a system of sanitary quarantine may be made, there is always the risk of the poison being introduced through some unsuspected, and therefore unguarded, channel.[2] To meet this risk leads to further consideration of the third proposition, — that the poison flourishes amidst filth.

Whether the disease is in its indigenous

[1] Assuming that yellow-fever is "due to a specific cause which is capable of growth and reproduction," and which is transportable, not only by adhesion to surfaces, but in the air from an infected locality; and that the "growth and reproduction of this cause [i.e., the yellow-fever poison] is connected with the presence of filth, in the sanitary sense of that word, including decaying organic matters and defective ventilation," — it follows that closed vehicles, compartments, or receptacles, and articles or masses of material capable of retaining air motionless in meshes, folds, webs, or interstices, are dangerous as contagion-carriers in proportion as their character, use, or structure prevents or retards aeration, and in proportion as such articles or materials furnish organic matter liable to decay: hence an empty box-car, or the unventilated hold of a vessel in ballast, may be the means of introducing the poison by transporting infected atmosphere . . . [extract from a "Memorandum for the classification of articles of merchandise for quarantine purposes," drawn up by the writer, and adopted by the Sanitary council of the Mississippi valley, April 21, 1881].

It will be seen from the above that the disinfection necessary for yellow-fever is essentially different from that laid down by the recent International sanitary conference at Rome as sufficient for cholera. In the report of the committee of that conference on the question of disinfection, and which embraces such eminent men as Koch, Sternberg, and Proust, it is specifically stated that 'disinfection of merchandise and of the mails is unnecessary;' while, of atmospheric disinfection, no mention whatever is made in the report. That these are both essential for yellow-fever, is, in the opinion of the writer, beyond question. His personal experience during the epidemics of 1878–79 alone — notably, that on the relief-boat Chambers, in connection with the infection of Lieut. Benner and others — is to him conclusive on this point.

[2] Intercommunication with Mexico by rail, for example, suggests one mode which as yet has not been provided against; although an extension of the system of sanitary supervision to railroad intercourse is entirely feasible, as has been shown during the past few years by the operations of the inspection services above referred to.

home, or imported, the testimony is uniform that epidemics of yellow-fever have their starting-points in the lowest, filthiest quarters of seaport towns, than which nothing can be filthier or more disgusting. It can hardly be necessary to dwell upon this point. With the improvement in the water-side precincts of New York, Philadelphia, and other North-Atlantic seaports, yellow-fever has ceased to be the devastating pestilence which it was in the days of Benjamin Rush. In those days the purlieus of such cities were little better than they now are in the towns and cities of the Spanish main, where it still rages. In the latter, it is true, there is always present the added factor of a favoring condition of temperature; and, less constantly, this also affects our Gulf and South-Atlantic seaports. But this of itself should be an additional incentive to securing the best attainable sanitary condition. Foul drains, filthy streets, reeking gutters, neglected cloacae, excremental accumulations, decomposing garbage, rotting fruit and vegetables, the drainage of sugar and molasses casks, — the wonder to the sanitarian, as he views such scenes for the first time under the tropical rays of a summer sun, is not that yellow-fever occasionally occurs, but that pestilence in some form is not always present. In the endemic home of yellow-fever, 'sanitation' is an unknown term; and, in the degree that its import is ignored along our Gulf and South-Atlantic coasts, the disease finds favorable conditions for establishing itself whenever its poison is introduced.

An obvious precaution is suggested by the fourth proposition, — that yellow-fever is a disease of cities and crowded populations.[1] As a rule, it is limited not only to cities, but to sharply defined quarters of cities. The great specific gravity of the poison, and its property of clinging to surfaces, are shown in this limitation of extension. Frequently its rate of progress may be mathematically defined, so many feet per day, independent of any recognized influence, except a perpendicular obstacle. A board fence has been known to stop its progress, as in Mobile; or a bluff bank to hold it at bay for weeks, as in Memphis. Not only do the higher portions of a city suffer less than the lower, other things being equal, but the upper stories of individual houses are safer than the lower. Yellow-fever is essentially a local disease, its existence depending upon particular circumstances of place: hence, when the disease manifests itself in a locality, the imperative duty of the sanitary authority is to remove from the infected place (be it house, street, ward, or quarter) all those susceptible to it, — to depopulate the infected district, if it tends to become epidemic, by removal to camp, if only a few miles distant, as was done with such satisfactory results in Memphis during the epidemics of 1878 and 1879, and repeatedly before that time in the U. S. army. The *cordon sanitaire* may be employed to prevent people from going into an infected district; but with the present resources of sanitary science, and definite knowledge of this disease, its use to prevent escape from such a district is a barbarism of the same character as the old-time quarantine of detention.

In a word, the precautions to be taken against yellow-fever are the same as those which common sense and experience have shown to be adequate against the other exotic infective diseases: to wit, a thorough system of sanitary supervision and control of intercourse, both by sea and land, for the exclusion of the specific poison; and, supplementing possible (if not inevitable) defects in this, the destruction of the conditions necessary to the life and activity of the poison by general and local sanitary effort within our own territory.

F. W. REILLY.

[1] Its occasional extension to small places, and even to plantations and isolated houses, does not affect the general accuracy of this proposition. Such extension occurs only during widespread and virulent epidemics, when, it may be inferred, the specific poison is generated in such quantity and intensity as to be the more readily transplanted from place to place.

CHICAGO-RIVER POLLUTION.

IT is worthy of note that the first sanitary regulation made by the authorities of the town of Chicago had reference to the protection of the river from pollution. Nov. 7, 1833, the town trustees declared it to be unlawful "to throw or put into the Chicago River, within the limits of the town, any dead animal or animals, under a penalty of three dollars for every offence." More than half a century later, the problem of establishing and maintaining an inoffensive condition of this stream still demands the attention of the sanitarian. A glance at the topography of the region will facilitate comprehension of the problem, and assist in its solution.

While the western portion of Cook county is embraced in the general slope of the watershed of Illinois and the interior system of drainage of the State, — which is to the south and west, and ultimately into the Gulf of Mexico, through the Mississippi River, — the region of Chicago, embracing the greater portion of Cook county, drains naturally into the Gulf of St. Lawrence, through the Great Lakes