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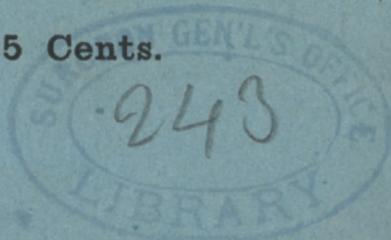
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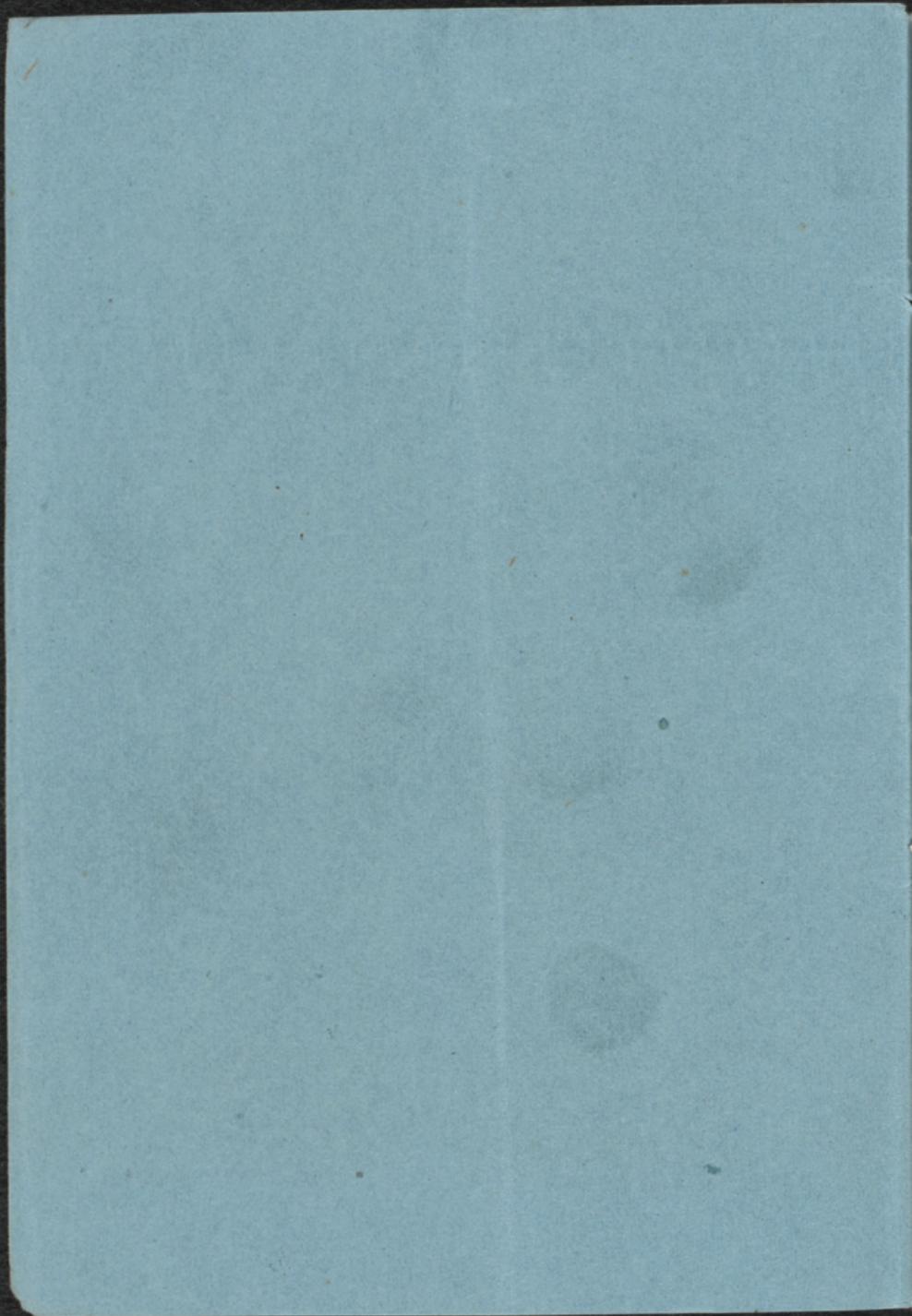
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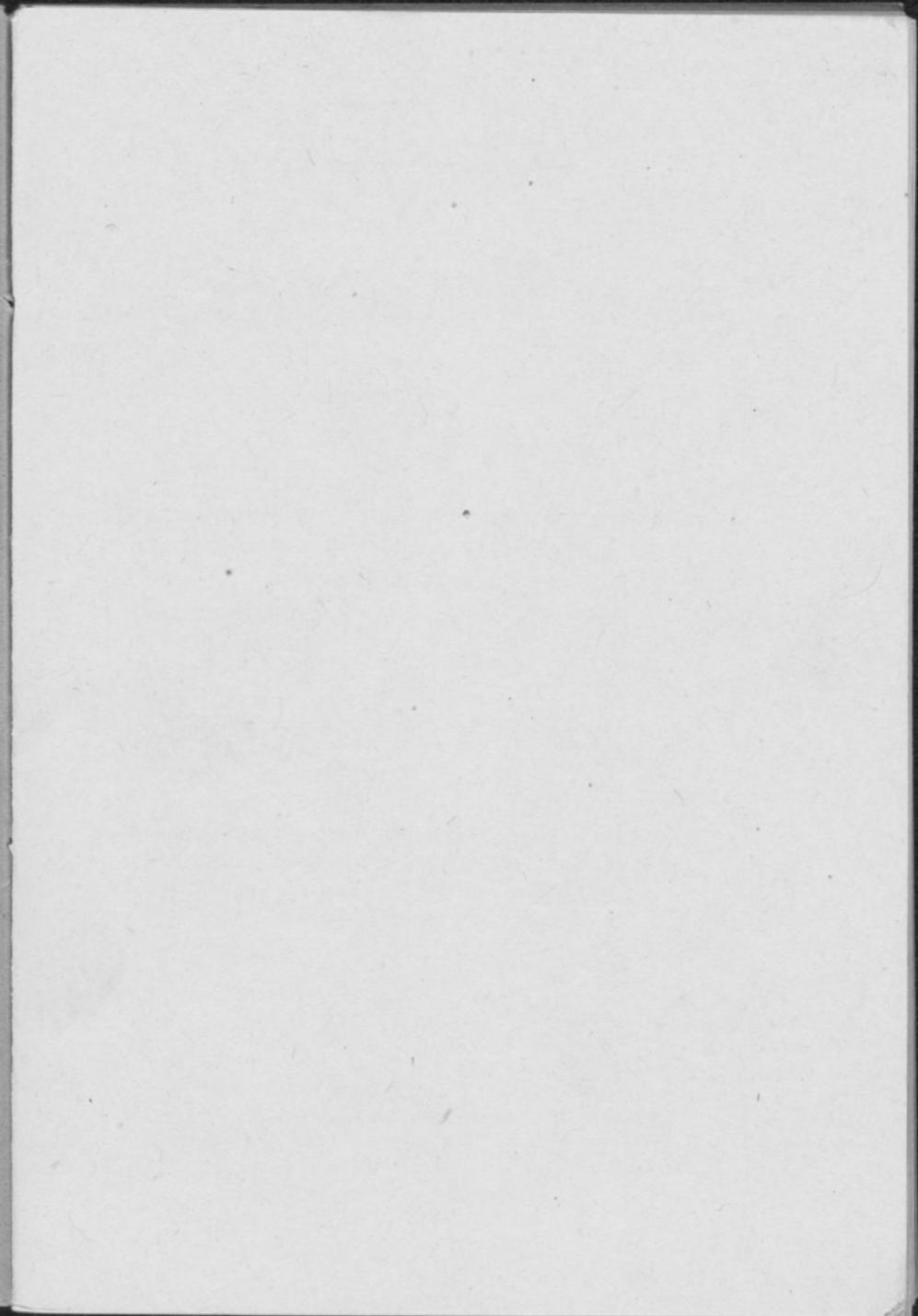
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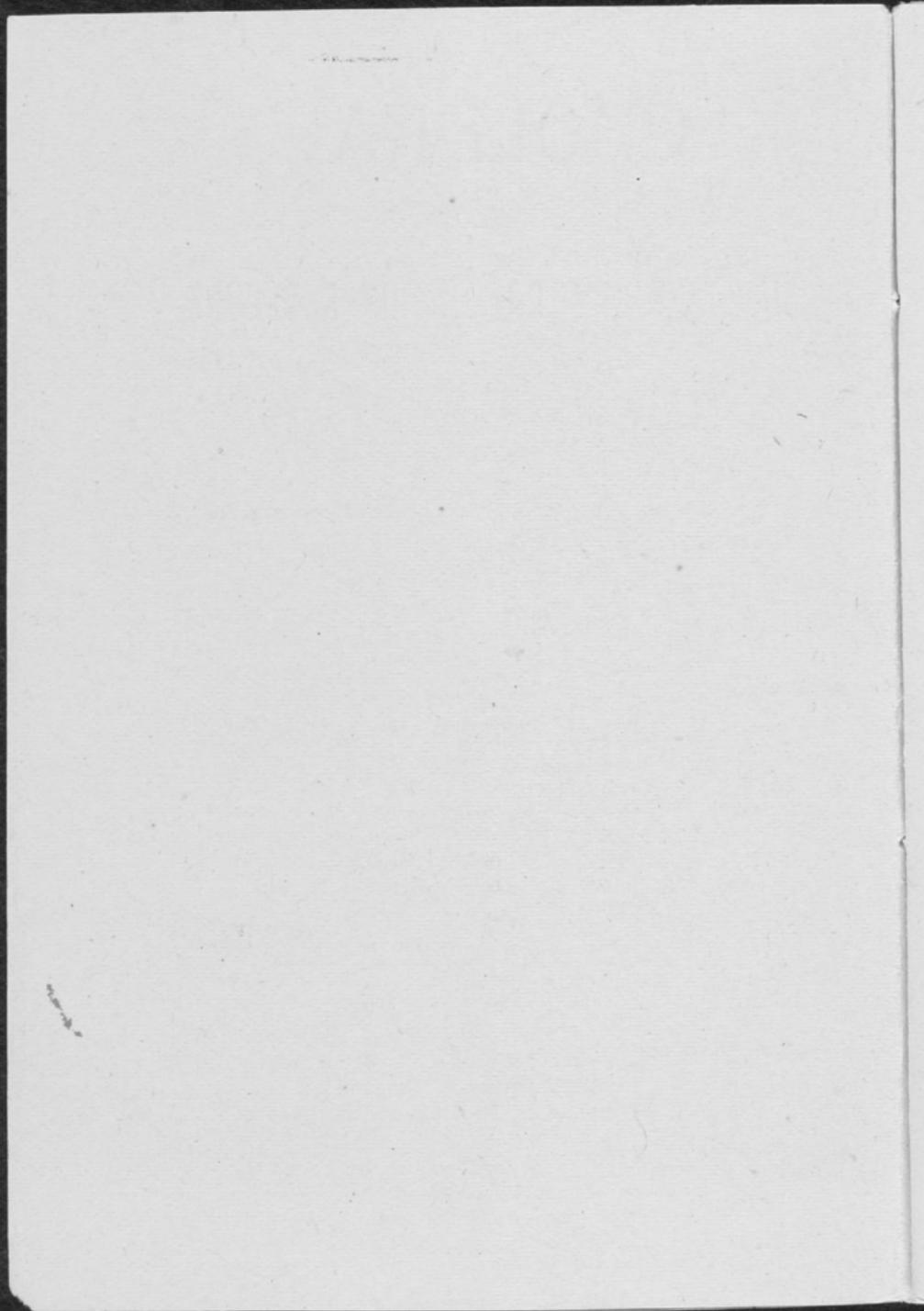
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CHOLERA:

ITS

CAUSE, HISTORY, PREVENTION AND CURE.

A LECTURE DELIVERED UNDER THE AUSPICES OF THE YOUNG
MEN'S CHRISTIAN ASSOCIATION, AT GEOLOGICAL HALL,
ALBANY, N. Y., MAY 28, 1885,

BY

W. O. STILLMAN, A. M., M. D.,

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stitute; of the American Association for the Advancement
of Science; Author of a Hand-book on the Saratoga
Mineral Waters; etc., etc.



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CHOLERA.

It is my purpose to present to you this evening a resumé of the latest results of medical and scientific research concerning Asiatic cholera, and I think it only fair to warn you that the lecture will probably be found more practical than popular, and more instructive than merely entertaining. While it seems exceedingly desirable that the public should become acquainted with the nature and sanitary treatment of this disease, it is equally desirable to avoid an unreasoning panic and alarm, either over its possible advent or its presence. This can best be done by a correct understanding of the disease. When it is seen that cleanliness, and municipal and personal hygiene can speedily limit and stamp out the epidemic, it loses its old terrors, and all will lend a cheerful and willing assistance to do whatever is necessary for the public good. Intelligent coöperation on your part will add greatly to the effectiveness of the work of the sani-

tary and medical authorities, should the pestilence visit us this summer, and an hour's time devoted to the consideration of this subject will be well spent if you can carry away with you such information and advice as medical science has now to offer, and a determination to do your share in the duties of the hour.

Cholera belongs to a class of diseases sometimes significantly called "filth diseases." They are extremely destructive to human life. As the name "filth disease" indicates, they are the product of filthy, overcrowded, and unsanitary conditions of life, and are perpetuated, fostered and extended by such conditions. In this fact we hold the key of a successful opposition to them. Nowhere do we find conditions so favorable for the generation and development of a "filth disease" as those which exist at certain times in India. Accordingly that is the quarter from which this, the most terrible of modern pestilences, stalks forth on its mission of destruction.

The mode of origin of cholera in the East has a scientific as well as popular interest, for we naturally reason that the conditions which favor its origin there must also favor its propagation here. I will briefly recount the well-known

history of the disease before speaking of the special conditions which cause the periodical outbreaks in India. It has been claimed that cholera has manifested itself independently in Egypt, Russia, the Mississippi valley, and elsewhere, but a searching investigation of the alleged instances has shown the claims, I think, to be unfounded.

Cholera, similar in severity and epidemic character to that which we now call Asiatic cholera, has been known in both Europe and Asia since the earliest recorded history. It seems probable that then, as now, it has taken its origin in the East; that its mode of invasion was the same in the days of Greek, Roman and Saracenic supremacy as in our own time; but its period of greatest destructiveness has been largely confined to the last one hundred years.

Prof. Martin Haug claims to have found distinct references to it in ancient Sanscrit writings, and descriptions of the disease are also found in the works of Celsus, Galen, Oribasius, Aëtius, Serapion, the Mohammedan writers Rhazes and Avicenna, the Persian Aby Ben Hasein, and others of various nationalities, scattered through the centuries, down to the Middle Ages. Since

then, and especially since the Portugese discovery of the route to India, by way of Cape of Good Hope, which for the first time really brought Europeans in direct commercial relations with the East Indies, the disease has been more rationally and scientifically examined and recorded than ever before. Various outbreaks of cholera, mostly well localized and not disastrously destructive to life, have occurred in several European countries as well as in India, Java, Sumatra, Japan and China, during the last 250 years. From about 1781-2 dates its prevalence in a more virulent form, and in 1817 occurred the terrible epidemic, breaking out simultaneously in various parts of India, which drew the eyes of Christendom and the world upon this fearful pestilence. The inhabitants of that ill-fated land perished by tens of thousands, like cattle before the murrain. The young, the old, the well, the debilitated, fell alike before the scourge, and in an hour were stricken from health to death. From that year the plague began its slow approach upon the world beyond the confines of India. It ultimately penetrated to the remotest bounds of civilization, and was felt in Europe and America in the epidemics

of 1831-2, and immediately succeeding years.

We now come to consider the conditions which originate this pestilence in the land to which it is native. Religious festivals and pilgrimages are very frequent in India, and to these, in connection with the filthy and unhealthy habits of the natives, is largely to be attributed the severe outbreaks of a disease which always prevails in a milder form in certain districts.

From Dr. Hunter's Orissa we learn that twenty-four high festivals take place every year at Jugernaut, below Calcutta. At one of them, about Easter, 40,000 devotees indulge in hemp and hashish to a degree that shocks the observers. The "car festival" takes place in June or July. For weeks before the pilgrims come trooping in by thousands every day. These are fed by the temple cooks to the number of 90,000; and over 100,000 men and women, many of them unaccustomed to exposure or hard labor, tug and strain at the car till they drop exhausted and block up the roads with their prostrate bodies. Day and night, through every month in the year, troupes of devotees pour along the great Orissa road, from Calcutta, and for 300 miles every village has its pilgrim encampment. The parties

consist of from 20 to 300 persons, and at the time of the great festivals these bands follow so closely as to touch each other. At least five-sixths are females. Ninety-five out of every one hundred are on foot, but occasionally some great nabob and his ladies sweep past with forty or fifty palanquins, 300 bearers and fifty luggage carriers; or a big Rajah with his caravans of elephants, camels, horses and swordsmen, in all the indescribable dirt and confusion of Indian royalty.

Parts of this great spiritual army march hundreds and sometimes thousands of miles. They are drummed up from every town and village by about 3,000 emissaries of the temple, who visit every province and district in India in search of dupes. They often travel a thousand or fourteen hundred miles by railway, but generally have to walk from three hundred to six hundred miles on foot, and are forced up to doing a full day's journey. Many a sickly girl and feeble man dies on the road, and all arrive lame, with feet bound up in rags and plastered with blood and dirt. They rush into the sacred tanks promiscuously, and into the sea, and come out to dress in clean garments. The dead are buried in the sands,

and the hillocks are covered with bones and skulls washed bare by the tropical rains. Disease and death make havoc among the pilgrims, for they are badly lodged and poorly fed. The temple kitchen has secured the monopoly of cooking for the multitude. When the food is fresh it is not unwholesome, says Dr. Hunter, but it is too sacred for the least part to be thrown away. Large quantities soon undergo putrefactive fermentation, and in forty-eight hours much of it is a loathsome mass, utterly unfit for human use. It is then dangerous to a man in robust health, and deadly to the wayworn pilgrims, half of whom reach the temple with some form or other of bowel complaint. This food forms the chief subsistence of the pilgrims, and the sole nourishment of the beggars, who flock in by thousands. It is consumed by some one to the very last morsel.

The natural drainage of the place is checked by sandy ridges, and the city is a very dirty one. Each house is built on a mud platform about four feet high, in the centre of which is a hole which receives the filth of the household. The wretched inmates eat and sleep around this death trap. The platforms are covered with rooms,

without windows or roof ventilation, and into these caves of disease the pilgrims are massed together, at a temperature as hot as our hottest Julys or Augusts, for seven months. The scenes of agony and suffocation that take place in these putrid dens, says the writer, baffle description. In some of the best of them, 13 feet long, 10½ feet broad, and 6½ feet high, with but one entrance and no escape for the effete air, eighty persons pass the night. The stench, he adds, is overpowering and the heat like an oven.

The car festival, the culmination of religious interest and fanaticism at Juggernaut, falls at the beginning of the rainy season, when with tropical copiousness the water pours down almost in solid sheets. Every lane and alley becomes a torrent or a stinking canal, and the wretched devotees are driven into their foul lodgings for daily refuge. Cholera invariably breaks out. The living and dead are huddled together, with a leaky roof above, a pestilential cesspool beneath, and only so much space allotted to each person as can be occupied in lying down. In the corpse-fields around the town forty or fifty bodies could be seen at a time. Carnivorous birds were found sitting around gorged, and wild dogs lounged

about full of the flesh of man. The streets presented scenes of the most appalling misery. In one sudden storm the bodies of poor deserted women formed a dam to the insufferable filthiness from a thousand bodies which was being washed down by the sudden tempest. Many were too weak to rise, and the living and the dead lay piled in the flood in horrible promiscuity.

It is from such conditions as these that Asiatic cholera has its origin. The concentrated poison emanating from festering filth, decomposing food, decaying corpses, and huddled armies of wild devotees, all sweltering beneath a tropical sun and on a soil saturated by centuries of contamination, is spread by the persons of millions of wandering pilgrims throughout India, and extends its virulence in far off lands.

It is not one such festival as has been described which alone generates disease, but seven great pilgrimages occur yearly in various parts of India, besides hundreds to minor shrines. Every twelve years occurs a season of peculiar sanctity, associated with a vast increase in the pilgrim throngs, and it is to these periods that our later epidemics can be traced with a terrible certainty. It would seem that the British gov-

ernment might exercise greater sanitary stringency than it has hitherto and mitigate this plague which has devastated so many lands.

For a long time the way in which cholera spreads was a mystery. A common theory was that it was carried in the air. If this had been so it must have been found in the direction of prevailing winds. Practically this was discovered not to be the case. It has always followed the routes of travel: first the slow trail of the caravan over the desert, then the pathway of the sea on merchant ships, and now it hurries with greater rapidity, on the wings of steam, along the Red Sea and over Europe and America. It has been declared, and I believe correctly, that, as I have said, there is no satisfactorily authenticated case where genuine, epidemic Asiatic cholera has developed spontaneously in western lands. Asiatic cholera has never occurred in America without a previously existing outbreak somewhere in Europe.

We have already considered the conditions which give rise to the cholera poison. Let us go a step farther and see if medical science can tell us what that poison is. I think that it can at last give an intelligent and satisfactory answer. What

a rough and thorny road mankind and medicine has trod since the days when our ancestors impotently raged and declared the plague a visitation of wrath dropped mysteriously from the heavens, to this, our Age of Analysis, when a spectacled professor peers through his microscope, and studies his biological tube, declaring the appearance, habits and characteristics, of this earth-born minister of death. Divine wrath becomes outraged natural law. Man cannot infringe upon or break the laws of physical health, any more than he can those of spiritual health, and escape the penalty which follows.

As long ago as 1840, Dr. Henle reasoned that cholera, and all infectious diseases, could only be produced by living germs. In 1872, before Koch had made his great discovery of the cause of cholera, Dr. Henry Hartshorne, of Philadelphia, wrote: "My theory is * * that the cause of cholera is a (as yet undiscovered) protozoon, or microphyte, of extreme individual minuteness; which, on entering the human body, affects it as an organic poison." The latest developments of practical scientific research tend very strongly to confirm the views advanced by these gentlemen, and many others.

In these days one does not advance far in medical discussions without running foul of the so-called "germ theory of disease." Like Banquo's ghost, it will not down. As you are not all medical men you will, perhaps, pardon a few words of explanation. The germ theory of disease means simply this,—that certain diseases are caused by exceedingly small living bodies which on gaining access to the human body increase and multiply in the liquids, or tissues, to such an extent as to prevent the natural processes of the body from going on. The results of this disturbance constitute the given disease.

I suppose you have no very clear idea how minute these germs, or bacteria, or microbes, as they are variously called, are. To say that they are invisible to the naked eye does not explain much. One kernel of corn weighs about five or six grains, and it takes sixteen hundred millions of these little bodies to weigh one grain. A microscope that magnifies 600,000 times does not make one germ look as large as the head of a pin. Naturally you say, "How is it possible for such little things to cause a grave disease?" I will explain. These bacteria multiply by simply dividing in two. They will divide when about

an hour old. It has been estimated that "one single bacterium, which during the first hour has divided into two, these within another hour into four, and within three hours into eight, after twenty-four hours have already become sixteen and a half millions, after two days two hundred and eighty-one and a half billions, and after three days forty-seven trillions. If in this manner the development and multiplication could progress unimpeded, the breed of bacteria springing from one germ, * * * within less than five days, would completely fill all the oceans of the earth ;" and the descendants of a single bacterium, which as I have said weighs but one sixteen hundred millionth of a grain, would, within three days, reach the enormous weight of fifteen million pounds. It will readily be seen that any such multiplication going on in the body must seriously interfere with its health.

It is now proper to ask the question, not, "How can such little bodies produce disease?" but "How is it possible for any of us to escape such a terrible race of enemies?" In the first place bacteria, like men, *must be fed* to exist and multiply. They also, like men, must have proper food and conditions under which to

flourish. These are not easy to find, and the result is that but few of the vast armies of bacteria ever accomplish their destiny. The bacteria which produce disease must first gain access to the human body. With proper care and cleanliness in regard to food and drink this is not easily accomplished. Then too the body has a certain healthy resistive power. Sanitary medicine is also discovering how the discharges from diseased bodies may infect the air, or water supply, or even food, of the healthy ; and better drainage, uncontaminated sources of water, and ways of rendering food and drink innocuous, if infected, are lessening the dangers and damage from bacteria. Then too it must always be remembered that diseases of the infectious type, the class ever caused, it is claimed, by germs, must take their origin either from pre-existing cases or flagrant violations of sanitary law. This follows as a natural corollary of the fact that human life could not exist if man were so out of harmony with his surroundings that infectious plagues could spring up spontaneously in every day life without violence having been done to the ordinary laws of health. The race would be speedily exterminated if this were the case.

There is, at this moment, in the air you are breathing, an infinite multitude of living germs. These are awaiting a proper soil in which to develop. When they alight on it they will increase and multiply in the prodigious manner which I have related. They are not only in the air we breathe, but in the food we eat, and in the water, milk, beer, or, in fact, most liquids which we drink. Fortunately the *disease germs* are not ordinarily thus present around us. The great mass of these little every day neighbors of ours is composed of the bacteria which produce decomposition. These can find no food or affinity in healthy, living tissues, but as soon as Death has seized any living thing, these, his acolytes, begin their function. All the putrefactive changes which occur in the dead are due to their action. The loss of substance and form, the spoiling of meat, the moulding of bread and cheese, the souring of milk, etc., are all due to germs contained in the air. But I must not longer occupy your time with the consideration of germs in the abstract.

You have now learned, without burdening your attention with technical names and distinctions (and there are many of them), something

about the subject of bacteriology. The next step, naturally, is to ascertain what proof exists that cholera is caused by any special class of these little bodies, which vary greatly in appearance and characteristics.

What reason have we for supposing that any disease is produced by germs? Long ago, before the valuable revelations of the microscope began, it was reasoned out, by philosophical minds, as I have said, that nothing but the presence of a living poison would explain the action of the virus peculiar to each infectious disease. It is only on the principle of the vast growth and increase of these germs, which has been demonstrated, that the possibility of one person infecting an entire city or nation can be realized. If the poison were like strychnia, or arsenic, it would affect one person, and that would be the end of it. Then, too, a small dose of strychnia is medicinal; but a small dose, no matter how minute, of the cholera virus is terribly dangerous. If the poison were simply decaying matter then we should have cases of infectious diseases constantly arising without pre-existing instances. It is soon found that each infectious disease has a special, characteristic poison, and that this

flourishes best under certain circumstances which suggest low forms of animal or vegetable life, and that the means best calculated to destroy low forms of life best counteract these diseases. Considerations like these, as well as the work done during the last ten years with the microscope and culture apparatus, have caused the great bulk of the thinking and reading members of the medical profession to adopt the "germ theory of disease" as applied to certain classes of diseases. That certain diseases are caused by bacteria is generally accepted. Of these may be mentioned anthrax, first demonstrated by Pollender; relapsing fever, demonstrated by Obermeyer; lepra-bacilli, by Hausen and Weisser; typhoid-bacilli, by Klebs and Koch; tubercle-bacilli (the cause of consumption), by Koch and Baumgarten; and the glanders bacilli, demonstrated by Schütz and Israel. Dr. Koch's alleged discovery of the bacteria which cause cholera has been, and is still, very actively controverted. Whether he has succeeded in distinguishing the special organism which causes the disease, or not, there can be no doubt that it is produced by bacteria, and that sooner or later the point will be definitely settled.

That you may judge for yourselves how convincing Dr. Koch's experiments are, I will give a brief resumé of his researches in Egypt and India last summer.

When Dr. Koch arrived in Egypt, he acted as the director of a commission appointed by the German government to investigate the cause of cholera, and at once set to work, with his assistants, to make post-mortem examinations of bodies of deceased cholera patients. Notwithstanding the most careful examinations, neither in the blood nor tissues of the body, could bacteria be found that would account for the disease. The discharges and intestinal contents were next examined. "Certain bacteria which his experienced eye," to quote the words of one of his enthusiastic admirers, "at once recognized as a species characterized by a form and behavior differing from those of any known to him, always re-appeared in the contents of the bowels and the discharges of cholera patients; and the more recent the case, i.e., the more rapidly death had taken place, the more numerous were these bacilli, and the less were they accompanied by other micro-organisms. * * It was not until Koch had arrived at Calcutta that he found an

opportunity to dissect several bodies of patients who had died within an hour after having been seized by the first symptoms of cholera. In these cases the contents of the intestines showed the same characteristic bacteria in their pure culture* and in enormous quantities."

"Koch at once began the necessary bacteriological investigations. In consequence of their peculiar form, greatly resembling a comma, he gave them the name of comma-bacilli. When subjected to the process of artificial pure culture, he soon discovered that the comma-bacilli behaved in a manner utterly at variance," still using the language of the writer previously quoted, "from that of any other known species of bacteria." The details of these experiments it is unnecessary here to recount.

The next step was to discover some of the conditions of its existence. It was found that if the comma-bacillus was deprived of moisture for several hours, it lost its vitality, though it might regain its power of reproduction if again exposed to favorable influences. If, however, it was deprived of moisture for as long a period as twenty-four hours it was permanently destroyed.

* That is, with hardly any admixture of other organisms.

This fact is one of great importance, as it explains why, when a cholera epidemic has once completely died out in western lands, it never breaks out again without a fresh importation of the cholera virus.

Another and more important limitation of its existence, discovered by this keen-eyed observer, was that while the cholera germ, the comma-bacillus, cannot live without moisture it cannot live at all in any moisture, or liquid, which is acid in its character, and the stronger the acid the more fatal is it to this bacterium. Now the contents of the intestines are alkaline, and there the comma-bacilli can develop enormously, but the stomach, if healthy and in its natural state, is always acid. Note the next point, please. On "investigating the mortality records and the reports sent to him by physicians that had enjoyed a great experience in cholera epidemics, Koch found," quoting Prof. Engel, "that not a single individual in the possession of a healthy stomach had ever been attacked by cholera." It is unnecessary for me to characterize this as probably too sweeping an assertion.

The most conclusive proof which could be offered of the genuineness of Dr. Koch's great

discovery would naturally be the production of the disease in animals by feeding them on food infected with the comma-bacilli. The experimenter failed of success in this attempt, but what he failed in, others succeeded in accomplishing. Koch, quite forgetful of his recently demonstrated fact that these bacteria cannot live in the healthy stomach juices, had been wasting his time by placing them there to be destroyed by the acid.*

Professors Rietsch and Nicati, during the epidemic in Marseilles, by injecting the comma-bacilli, obtained by culture processes, directly into the intestines, produced the characteristic symptoms of cholera. Dr. Koch then repeated these experiments, and on injecting the one hundredth part of a drop of a fluid containing the comma-bacilli, reared by artificial means but originally obtained from cholera patients, the animals all died in from one half to three days, with all the symptoms of Asiatic cholera. The post-mortem examinations, it is claimed, revealed exactly the same condition of the intestinal canal that is met with in human bodies of patients who

* The experiments were on healthy animals with healthy, acid stomachs.

died the second or third day of the disease, and in the intestines were found innumerable quantities of comma-bacilli in the state of pure culture.

The final and necessary proof, in order to complete the chain of evidence which shall fasten the responsibility for this disease upon the comma-bacilli, is that it shall be shown that persons affected by cholera have taken them into their stomachs, or that their food or drinking water, is contaminated by them. This Dr. Koch claims to have done. Both in Egypt and in India, where a severe local epidemic was occurring, he found a history of fouling the water supply with cholera filth, and discovered the comma-bacilla in large numbers adhering to various bits of organic substances, such as splinters of wood, etc., in the water.

Of course, Dr. Koch's discovery has met with rigid investigation, and exceptions have been taken to his announcements by eminent observers. It is the good fortune of our "age of machinists and calculators," as Carlyle calls it, that the dictum of one man is no longer accepted on faith and allowed to block the wheels of progress, if erroneous. We allow no Aristotles to put a screen of dogma between us and the

light for a thousand years, as of old. And you can rest assured that if the great German's results are accepted by modern science it will be because they have the inherent quality of truth and can pass through the ordeal triumphantly of themselves. To my mind, Dr. Koch's recent replies to his German, English and American critics have been on the whole satisfactory, and defended the integrity of his position successfully.

It is not strictly necessary, perhaps, to speak of the symptoms of cholera in this lecture, and yet our talk would lack completeness if no reference was made to that portion of our subject. Normally developed Asiatic cholera is usually characterized by three stages of the disease.

The first stage is that of cholera-diarrhea, which is not usually to be distinguished from any ordinary, painless, watery looseness. It may appear as apparently the result of some indiscretion in eating, and it is difficult to convince the patient, oftentimes, that it is the forerunner of the dreaded disease. So characteristic is this of cholera that out of 3,900 cases, reported in London in 1848-9, it was not wanting in a single instance.* In some cases this is associated

* It is not so uniformly present as this would indicate.

with vomiting, but not usually. It ordinarily yields readily to proper medical treatment, and the person may be free from the disease during the remainder of the epidemic. If left to itself, the patient may recover spontaneously, constituting what the French call *cholérine*. If not, the other stages of the disease may develop, or death rapidly occur.

The advent of the second stage is marked by the more pathognomonic symptoms of the malady. The character of the discharge changes from simple wateriness, or looseness, to an appearance resembling rice-water, or whey. They also become increased in quantity, often to an alarming extent, and vomiting sets in. This is usually unaccompanied by nausea or stomach sickness. There is thirst, and there are cramps in the abdominal muscles and legs, which cause great distress. Through this all the mental state is curious. The mind is perfectly clear, but with regard to the issue of the disease there is usually apathy and indifference, though before the attack sets in great terror may have been felt. The cholera patient very rarely weeps. It is noticeable that many diseases are accompanied by a characteristic frame of mind, de-

pressed, cheerful or hopeful, as the case may be, which may be quite independent of the person's ordinary temper.

The third and last stage, upon which the patient will enter if not recovered up to this time, now soon arrives. It is that called collapse, or utter prostration. The discharges have so drained the body of fluids that the features become contracted, the eyes sunken, the whole body diminished in bulk, and the skin wrinkled, cold, and corpse-like. The person appears to have suddenly grown old, and the countenance is often so much changed as to be unrecognizable by familiar friends. The lips, fingernails and skin become blue, and the voice sinks into a hoarse whisper. The features become more pinched, the breath becomes cold, the end arrives.

Recovery from the stage of collapse sometimes occurs. A reaction then sets in and is apt to be followed by a low fever, which may last a long time, and this may end in death as well as recovery. An interesting explanation of this fever has been made by Dr. Koch, based on his post-mortem examinations. He found that when death did not rapidly take place, the comma-

baccilli found their way into the lining membrane of the intestines and soon set up an inflammation somewhat resembling that of typhoid fever. If the patient still survived he found that the excess of these pernicious bacteria in the tissue cut off the blood supply, and mortification resulted. With this mortification, or death of portions of the intestinal lining membrane, the septic bacteria, or bacteria of decomposition, made their appearance. These soon took the place of the comma-bacilli, which vanished. The cholera was then wholly past, and the low typhoid-like, or septic fever,* was fully initiated and ran its course.

You now have before you a tolerably clear picture of the disease, its cause, and its history. That which follows is naturally the *practical part*. What are we to do to defeat this enemy? What for personal prevention, what for collective protection? What is the value of diet, medicine, quarantine and sanitation?

I shall have to take these questions up singly. But you, perhaps, with a desire to arrive at definite information immediately, demand—quite

* Dependent upon blood poisoning from the absorption of decomposing matter.

unmindful of the provokingly serene composure of scientific answers—"Can we be protected?" I unhesitatingly answer, "Yes, if you are willing to take the trouble."

Perhaps no more striking proof of this is to be found than that contained in the Report of the Registrar of Vital Statistics on the New York City cholera epidemic of 1866-7. He says, "In houses and localities where well marked first cases were not promptly treated by local cleansing and specific disinfection, cholera soon gained a foothold as a local epidemic, and we have found no large group of fatal cases in which this was not true, while in a great number of instances where the disinfection was prompt and adequate, *the arrest of cholera in the very worst localities and the worst houses and population was immediate and final.*"

"*In three hundred and sixty-two houses where individuals or families were smitten with cholera, but which were promptly brought under full sanitary control by disinfection and sanitary purification, the pestilence did not extend beyond the family in which the first case occurred.*"* When

* Not an officer or employé of the four cholera hospitals was attacked.

the cholera was in Paris last summer hardly more alarm was felt in the best quarters of the town than was felt here in Albany. Business and everything went on as usual, confident in the protection which correct sanitation afforded. Our present State Board of Health, through its efficient Secretary and Executive Officer, Dr. Carroll, who is with us this evening, in a memorandum dated last November, gives the results of observations on the cholera epidemic of last year in France and Italy, when it says: "Experience has shown that the cholera poison does not extend where no filth favors its multiplication, and the only way to arrest its march is to remove all sources of pollution of soil or water." His predecessor in office expressed the same sentiments in equally positive language. "The choleraic infection will not injure a population in any alarming degree," he wrote, "except in the presence of a filthy condition of premises, the air, or drinking water, one or all combined. This practical conclusion, derived from the world's experience of cholera epidemics and from sanitary science, is what all people must understand and put in practice for their own safety. "What vaccination is to small-pox,

hygienic regulations are to cholera," is the opinion declared in the Congressional Report on the cholera epidemic in this country in 1873. The fact that rural districts, where a small population to large areas of land prevents foul accumulations, are mostly free from epidemics, is strong proof of the correctness of such views, as well as the fact that the disease seeks the great and crowded and unsanitary centers, there lingering longest and doing its most destructive work. The more unsanitary the better for its development. Of Damietta, the place where cholera first broke out in Egypt during the last epidemic, M. Fauvel has said that the place was so filthy that the stench from it was noticeable ten miles away. Toulon and Marseilles, where the cholera first broke out and was the most virulent west of the Alps, have had the reputation of being the dirtiest cities in France. Of Naples it is hardly necessary to speak. Its unsavory reputation is everywhere known. It is the foulest city in Italy, and there again the pestilence did its deadliest work. A practical lesson is still further to be learned from Naples. There is a wide difference in the sanitary condition of the different quarters of the city, as I can testify

from having been in it shortly before the epidemic last summer, and while the worst quarters suffered terribly the better ones escaped nearly free. The more hygienically cared for Italian cities, you will remember, were also afflicted but slightly.

It is hardly necessary to dwell upon this point longer, though you cannot retain it too vividly. The value of municipal cleanliness, as well as disinfection, is urged by such eminent authorities as Dr. Hunter, the retired Surgeon-General of the Indian army, Drs. Parks, Wilson and Pettenkofer, the sanitary authors, Dr. Koch, Prof. Pasteur, and all of the most eminent medical men in France, Italy, Germany, England, and our own country.

The Cholera Commission of the German Empire, which met in 1873, made this unanimous report: "Of all the measures which may be applied to the prevention and combating of cholera, those take the first place which have for their aim the improvement of general sanitary conditions; all specific measures against cholera will prove unavailing unless we pay the strictest attention in inhabited places to the purifying of the soil from organic and easily putrefy-

ing refuse, to the drainage of the soil, to the constant flushing of the sewers, to the frequent emptying of cesspits, the complete doing away with previous cesspits, the careful inspection of dwellings, and closing of those which are really hurtful, the provision of pure water, both for drinking and other domestic purposes, and the like. The Commission expresses here the united opinion of all the most experienced physicians when it says that the strictest attention to all the measures demanded by the public general hygiene offers the best protection, not only against cholera, but against all other epidemic diseases."

Such being the demands of preventive medicine upon us "What are we going to do?" No, that is not the question, but, "How are we going to do that which is demanded of us?" What is the practical, summarized answer to all this demand for better sanitation?

I answer in one simple word, "Cleanliness." The Public Health Committee, of the corporation of Dublin, state the matter clearly. They demand "clean air, clean soil, clean houses, clean furniture, clean bedding, clean clothing, clean persons." Wage a crusade on all filth. In the first place insist upon having clean streets,

uncontaminated by offal, refuse, or filth of any kind ; not only clean in the better parts of the city but clean in the poorer quarters, where the greatest danger exists from all infectious diseases. All decaying animal or vegetable matter should be removed. If bad odors are noticed, see that the *cause* is removed. See that the scavenging is well done, that dirt and offensive accumulations are not allowed in alleys, lanes, gutters, and outhouses, and that the sewers work well.

If the full duty is done outside the house, and every one should feel bound to second the local health board to the utmost and call its attention to unsanitary conditions, domestic requirements await attention and are still more important. In the first place have plenty of ventilation, abundance of good air and sunshine, and no musty holes and corners, or subcellars. Sewers require attention and should be flushed frequently, and a house cannot be healthy unless it is supplied with proper drains, and unless all waste pipes are without leaks and properly trapped. If these are not in good condition complain to the health authorities and insist upon having them made right. Do not tolerate odors about sinks, vaults, closets, outhouses, or waste pipes. Do

not allow slops, etc., to be thrown upon the ground ; filth permitted to sink into the soil of yards and gardens, or near the walls of houses, is not got rid of—the emanations from it come up out of the soil and poison the air we breathe. Vile smelling drains and stagnant water near houses should be cleansed or removed. Of the water supply and the excessive danger which results from its contamination in cholera I will speak shortly.

If the sanitary requirements to which I have now called attention were properly enforced in our city, with good personal hygiene, we should have little to fear. It is superfluous to say that they will not be. If not, and cholera should visit us, what then? As the instructions issued by the Board of Health of a neighboring State naïvely read: "Nature's disinfectants—earth, air and sunlight—are unequalled whenever they can exert an unobstructed action. Often, however, the conditions are such that neither can be relied upon, and then resort must be had to artificial means of disinfection."

If cholera should visit us this summer all should become acquainted with the use and action of the best disinfectants. If the filth

piles and refuse are not removed *they must be disinfected*. If there are offensive closets and vaults they must be purified. *All discharges from cholera patients must especially, and strictly, with no possibility of oversight, be efficiently disinfected*. Among the best disinfectants for public use, and recommended in the recent report on disinfectants by the American Public Health Association, is the following :

Chloride of lime,	-	-	-	one pound.
Water,	-	-	-	four gallons.

This costs about fifty cents a barrel, making it one of the cheapest as well as one of the best disinfectants which can be used. It acts very rapidly. All vomited matter, and discharges, should be thoroughly disinfected with this solution, and it should be thrown freely into all cesspools and vaults, and scattered in stables, dirt heaps, garbage boxes, cellars, or any place whence bad odors emanate.

A more powerful, but somewhat dangerous disinfectant for general use, is

Corrosive sublimate,	-	-	one ounce.
Permanganate of potash,	-	-	one ounce.
Water,	-	-	eight gallons.

This may be used in the same way as the first, and has the advantage, as far as comfort is con-

cerned, of being odorless. One pound of chloride of lime is required to disinfect each thirty pounds of vault accumulations, but one pound of corrosive sublimate will answer for five hundred pounds. As I have said, the last is a powerful poison, and requires great care in using. Sulphate of iron, commonly called green vitriol, or copperas, is also very useful in arresting decomposition, but has little power in killing germs.

There are three good ways to disinfect clothing—boil the articles for half an hour, or subject them to dry heat, 230 deg. F, for four hours, or, better still, to steam at a temperature of 230 deg. F. for ten minutes. One pound of sulphate of zinc and two ounces of common salt, to a gallon of water, also makes a good disinfectant which may be used for clothing before taking from the room and preparatory to boiling.

Remember that there is no disinfectant for the air of a sick room like plenty of good fresh air. A room that is occupied cannot be artificially disinfected in a satisfactory manner. When cholera has occurred in a building, the only safe procedure is to shut the house up and burn sulphur, three pounds to each 1,000 cubic feet of air space, for several hours. Then free washing,

whitewashing, etc., and open ventilation for some days. It should be borne in mind, as stated in the report of the American Health Association, already referred to, that "a large number of the proprietary disinfectants, so called, which are in the market, are simply deodorizers and antiseptics, of greater or less value, and are entirely untrustworthy for disinfecting purposes." These are the words of the report.

I do not expect you to remember all I have said on the subject of disinfection, or remember the formulas, but if you carry away some practical ideas it will perhaps have repaid you for your trouble.

Of the value of quarantine I have not much to say. Land quarantine was condemned by the noted Vienna Conference, and it has nearly always proved a failure. We must rely upon our sanitary defenses—cleanliness, disinfection and personal discretion, in the main. Still, as Dr. Parks says, it possesses one great value in helping us to detect the first cases occurring—a very important matter in crushing out a threatened epidemic.

In regard to personal hygiene much might be said, but I must be brief. Avoid great fatigues in the presence of cholera. In India this has

been found to strongly predispose toward the disease. In the light of Dr. Koch's views the condition of the stomach is very important. While it is known that the disease is taken through the stomach, and not by the lungs, or personal contact, people with strong stomachs have frequently swallowed the cholera poison with impunity. The germs were destroyed by the stomach acids. To keep that organ in good condition, do not eat or drink to excess ; avoid over-ripe or unripe fruit. Do not eat food not fully cooked, especially vegetables. Stale fish is a dangerous food ; so also is tainted meat. Drink no water that has not first been boiled, and then kept in a clean, covered receptacle. Sour milk is dangerous for children, and milk even may become infected through diluting or washing the vessels in which it is contained with infected water. The importance of an undefilable source of water supply cannot be too strongly emphasized. The cholera germs can only live where there is moisture, and there can be little doubt that a large proportion of persons taking cholera have received the disease with their drink. In the city of Calcutta changing the water supply of the city, alone diminished

the annual death rate so that where formerly 100 persons died of cholera but 33 now perish. Boiling the water always protects, but it is not practicable or possible to get all to do this.

It is said that, according to European statistics, the greatest number of deaths in the great cities from cholera, always occur on Monday. Undoubtedly two things principally conduce to this : first, the working population commits the worst excesses in eating and drinking on Sundays ; and second, there is then more visiting and commingling of the people than on other days. The moral is :—Beware of intemperance and unhealthy food and do not visit houses, during an epidemic, where there is sickness. Alcoholic intemperance is condemned by excellent authorities, as tending to disorder the stomach.

If any disturbance of the bowels does occur, no matter how trivial, do not delay treatment, for in the beginning it is easily controllable. All having oversight of children should especially remember this. It is to the honor of American medicine, that, so far as I am aware, although the acid treatment of cholera has been known for sixty years, it was the first to make *prominen-*

the great value of sulphuric acid in the preventive treatment of cholera.* The Report to Congress of the Supervising Surgeon of the Marine Hospital Service, on the Cholera Epidemic, 1873, says that "*we possess in the mineral acids a certain means of prophylaxis*" (that is, prevention) "*against cholera.*" While according to the report the prevention is so reliable, it further proceeds to show that the mortality, in cases already afflicted and treated with acids, is only 8 per cent., against 23 per cent. as the lowest by any other means.* Certain recent Italian experiences, as well as Koch's experiments, seem to bear this out. Much might be said of the value of this, as well as other means of treating cholera, but this is hardly the place for such discussion. I try to furnish you with practical results only.

As a general preventive a lemonade of sulphuric acid dilute, enough acid being used to furnish the requisite sour taste, has proved acceptable and successful. This should not be used, however, except when cholera is present, for certain medical reasons. If diarrhoea should begin when cholera is around, and no phy-

* The highest percentage of deaths of cases under treatment being 59 per cent.

sician be at hand, twenty drops of dilute sulphuric acid and five drops of tincture of opium (laudanum) may be administered every three hours, until the danger is over, or a physician can be called. This treatment has been highly successful on the other side of the water.

[The lecturer at this point made a digression in speaking of copper as a preventive, and referred to the almost absolute immunity enjoyed in Paris by the thirty thousand artisans employed in working in this metal, and its compounds, attributing the fact to the presence of sulphurets and sulphurous acid in the air of the workshops, as well as in copper mines, where the same immunity is enjoyed. Successful methods, practicable for physicians only, have been recently discovered by Italian and French doctors, based on the same principle.]

In conclusion, let me warn you against pinning your faith to any advertised proprietary medicines. Cholera is too dangerous a matter to trifle with, with irresponsible preparations. Remember that the cardinal laws of prevention, are CLEANLINESS, municipal and domestic, a GOOD DIGESTION, and ATTENTION TO THE FIRST INDICA-

TIONS OF THE DISEASE. And please bear in mind that the time to improve unsanitary conditions is before the epidemic comes ; not after the damage is done.

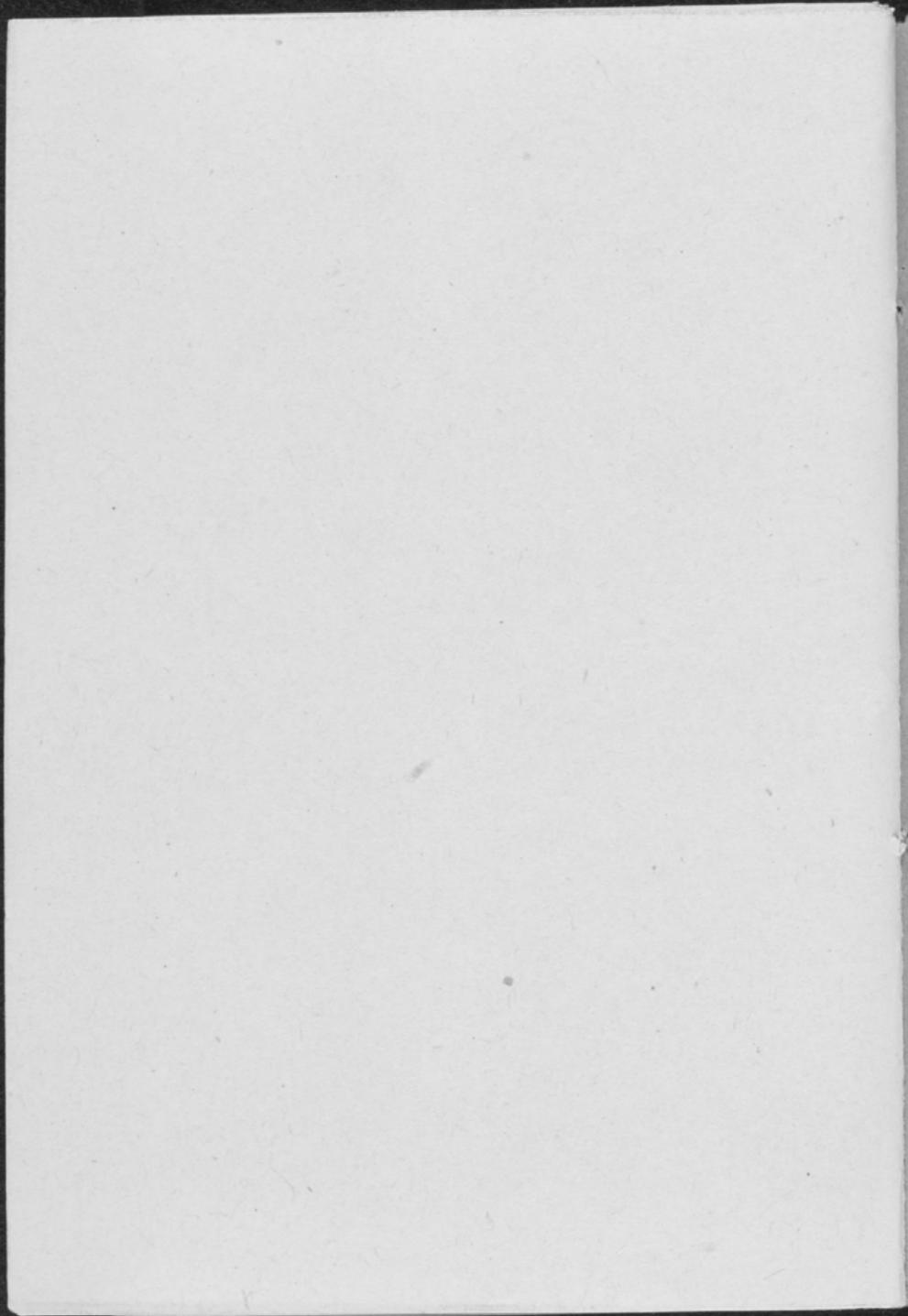
If a tithe of the advice which I have dealt out so lavishly is heeded and followed, as indicated by all previous experience, our city will have little to fear should cholera appear. Let us hope that we may not have to suffer its visitation. Whether we do or not, sanitary cleanliness and prevention is a good thing to have with us always. Nothing else arms so well to meet the scourges of sickness which constantly surround and threaten us, for in medicine, as in other things, an ounce of prevention is worth a ton of cure.

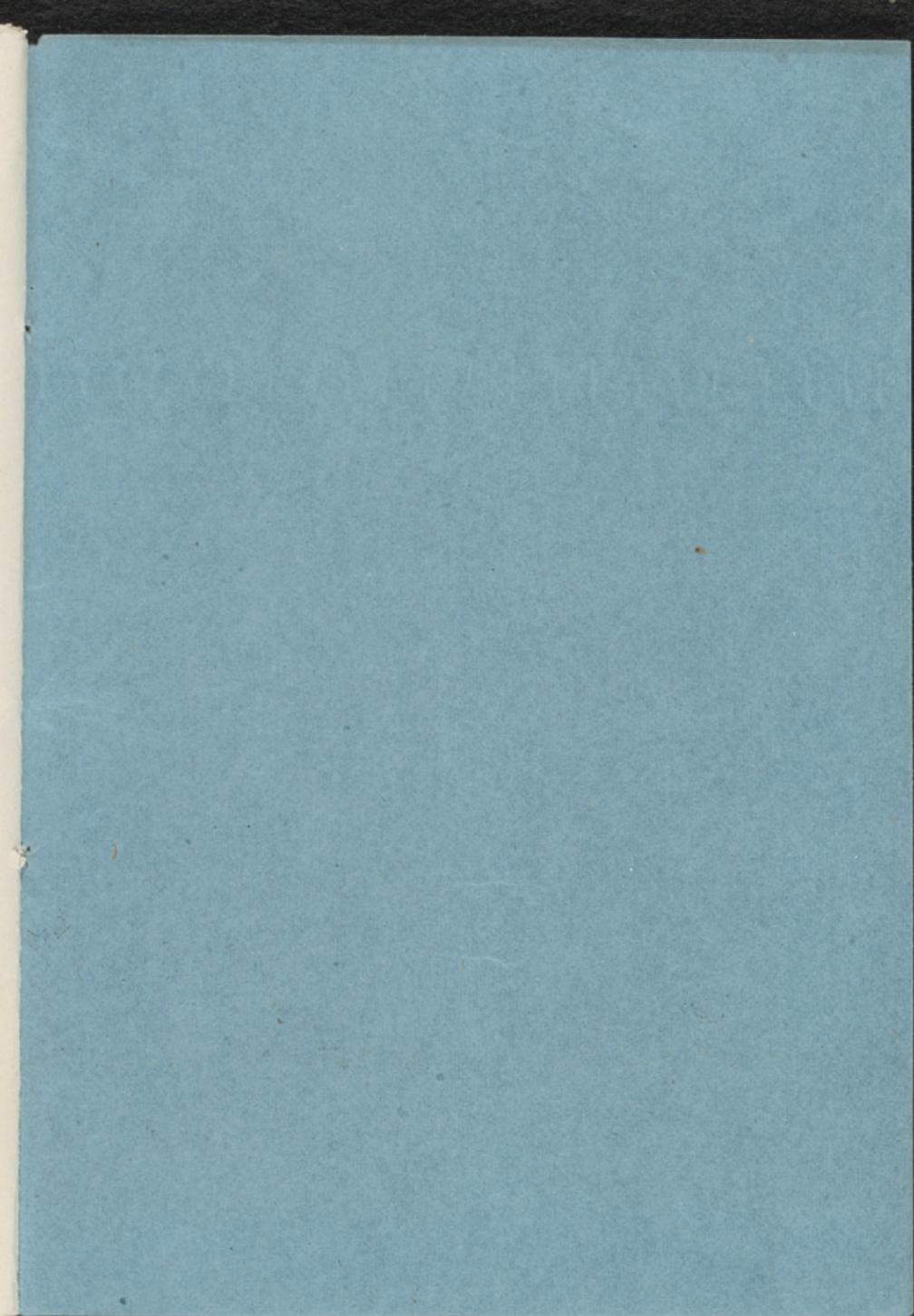
NOTE.

The lecturer desires particularly to acknowledge his indebtedness to the Congressional Report on the Cholera Epidemic of 1873, also to a lecture by Prof. Hugo Engel, and to the Sanitary Circular No. 1, issued by the Dublin Public Health Committee, for special information and certain passages quoted without acknowledgment in the body of the lecture.









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