As we discussed last week, knowledge of disease needs to fit into a way of understanding the world – a “framework” through which suffering makes sense. The following readings present different views of cholera, each with different understandings of disease and society.

As you read, consider the following questions:

What frameworks might we infer lead to these different understandings? How does disease “work” in each of these cases? What appears to be said and left unsaid in these different explanations? (That is, what does each author assume their audience knows already, and what needs to be explained?)

“Cholera Morbus Prescription,” 18 --. (Wellcome Collection)

A “prescription” describing (one view) of the steps that one should take to prevent and cure cholera around the middle of the nineteenth century.


An address from Governor Enos T. Throop of New York, to the New York State assembly, discussing the presence of cholera in the state. Note his opinion as to the causes of the spread of cholera, and his implied remedy.


A brief article describing the steps taken to ameliorate the risk of cholera at the 1893 Columbian Exposition, held in Chicago. Note especially how the author thinks about the matter of municipal authority in controlling cholera.

(OPTIONAL)

These optional readings give a little bit of the scientific background of debates about the cause, or “etiology” of cholera. As with the previous readings, it is instructional to note what the authors think is necessary to emphasize, and what they leave out.


Pettenkofer was a physician, a medical scientist, and an “anticontagionist” – that is, he didn’t believe that cholera was contagious. How could this be so? This document provides some clues as to his reasoning.


An earlier interview with Pettenkofer, in which he more quickly outlines his belief that cholera is not contagious.

Edgar Crookshank, “Remarks upon the Cholera Bacillus of Koch,” Lancet, 13 Jun. 1885, pg. 1072
Robert Koch was Pettenkofer’s opponent — a “contagionist” and advocate for the theory that cholera was caused by a bacteria. Of course, today this fact appears to be obviously true, but pay attention to how carefully Crookshank builds his argument in favor of the contagionist position, and how carefully he thinks about possible objections.
CHOLERA MORBUS.

The Following Prescription

for

THE CURE OF THE CHOLERA MORBUS,

Has proved greatly beneficial in numerous instances in FRANKFORT, and is strongly recommended by those who have had opportunity of witnessing its efficacious tendency.

One Pint of Strong Spirits of Wine.
One Pint of good White Wine Vinegar.
One Ounce of Powdered Camphor.
One Ounce of Flour of Mustard, or bruised Mustard Seed.
Quarter of an Ounce of Ground Pepper.
One full Tea-spoonful of Bruised Garlic.
Half an Ounce of Powdered Cartharides.

Mix the above well together in a Bottle, and expose it twelve hours to the sun, or in some warm place, taking care to shake it, repeatedly.

Let the patient be instantly put to bed, under warm Coverlids, and let his Hands and Feet be rubbed powerfully and uninterruptedly with the Mixture warmed. During this operation let the Patient take a Tumbler full of strong drink, composed of two parts of Camomile Flowers, and one part of Balm Mint. Persevere in this course, and at the end of Fifteen Minutes, at the utmost, the Patient will break out into a profuse perspiration, his Head and Body being well covered beneath the Bed-clothes. The Patient must be kept in this state between Two and Three Hours; he must not fall asleep. After this, remove the extra covering from off the Bed, and the Patient will drop into a slumber, which will last Six or Eight Hours, accompanied by a gentle perspiration. When the Patient awakes, he will find himself weak, but the disease will have entirely left him; he will require nothing but rest and a moderate diet to restore him to perfect health.

After having been rubbed, the Bed-clothes must completely cover the body and arms, as the slightest chill would occasion his death. When the Cramps in the Stomach come on, apply very hot dry Bandages of Bran and Ashes to the Pit of the Stomach, and when necessary, a Bladder of Hot Water to the region of the Navel.

The great object is to produce strong perspiration, and to restore the circulation of the blood.

In all cases where IMMEDIATE ATTENTION to the above Recipe has been had

the Patient has, under the Divine blessing, recovered.

The disease has been proved NOT TO BE CONTAGIOUS.

PRINTED BY A. E. BINNS, BATH.—PRICE ONE PENNY, OR FIVE SHILLINGS A HUNDRED.
Enos T. Throop, 1832.

State to convene, as a Legislature, at the Capitol in the city of Albany, on Thursday the 21st day of June next, at twelve o'clock, at noon.

Given under my hand and the privy seal of this State, at the city of Albany, the twenty-sixth day of May, in the year of our Lord, one thousand eight hundred and thirty-two.

E. T. Throop.

Governor's Message.

Fellow-Citizens of the Senate and of the Assembly.—At the opening of your last session, it was expected that the National Legislature would apportion among the States the representation in Congress, at a day so early as to enable you before your adjournment to divide the State into suitable election districts. Our hopes in this respect were not realized; and after a very laborious session, you adjourned, at the usual time, having previously provided by law for a contingent postponement of the next election, in case an apportionment should not be made. Since your adjournment, Congress has acted upon this subject, and fixed a ratio of representation in the popular branch of that body, by which our State is entitled to forty members, whereby the law postponing the election is annulled.

On the occurrence of this event, I have, in obedience to my constitutional duty, as well as in compliance with your expressed wishes, convened you at this time, that you might provide for the exercise by this State of its full voice in the councils of the nation. As this was my motive for calling you together at this unusual and uncomfortable season of the year, so it is the only business pertaining to your duties within my knowledge, now so urgent as to justify me in the exercise of this power. I am happy to be enabled to say this, and to express the belief that the public wants will not require of you to sacrifice your personal comforts and private interests to the duties of ordinary legislation, through a protracted session. [See note 12.]
MESSAGES FROM THE GOVERNOR.

There is one other subject, however, which I feel bound to present to your consideration, and which may be disposed of without materially interfering with your special business, or prolonging your session. I allude to the supposed approach, at a time of unusual health within our State, of the Asiatic Cholera; a direful disease, which, having spread desolation over a great part of Asia, has advanced with rapid strides through Europe, and is now supposed to have crossed the Atlantic and to be frightfully busied in the work of death among our Canadian neighbors. It is certain that a very malignant disease, in its type resembling the much dreaded cholera, is ravaging the hordes of squalid emigrants which have been recently disgorged from transport ships near our borders, and has been communicated from them to a portion of the population of the cities of Quebec and Montreal.

It has not been satisfactorily ascertained that the disorder has been communicated within our State, although a few cases of sudden death have occurred, which would not have attracted particular notice in ordinary times. Whether the disease which has proved so fatal in Canada is the cholera, or has been produced by the very unfavorable circumstances under which an unusual number of the most destitute class of emigrants have been landed during warm weather, in a strange climate, cannot be known without a more minute and scientific examination of facts. But so far as facts have been ascertained, there is reason to believe that the two disorders, if of different character in other respects, resemble each other in these particulars, that they are caused by inattention to cleanliness, and by enfeebling dissipations and excesses, and may be communicated from one person to another in a tainted atmosphere. Cleanliness in and about houses and neighborhoods is believed to be the most effectual barrier against the spreading of this and other similar diseases.
Most of the emigrants who land in Canada direct their course toward the United States, with a view of settling there, and thus expose our fellow citizens to the contagion of diseases which they may bring with them. Heretofore it has not been deemed necessary to guard any avenue for the approach of infectious diseases, except the city of New York, and our quarantine and health regulations relate chiefly to that city. No power now exists in any public officers or municipal authority elsewhere to interfere to prevent the introduction of disease into other parts of the State. We shall be annually exposed to similar incursions, and I respectfully recommend to you to pass such laws as may be necessary to enforce a sanative quarantine, at or near the other ordinary points of ingress to our State, and to invest the proper officers with sufficient power to act promptly and efficiently in times of alarm and emergency. An infinitely wise and just God has seen fit to employ pestilence as one means of scourging the human race for their sins, and it seems to be an appropriate one for the sins of uncleanness and intemperance; and when we can trace its existence and propagation under any circumstances to certain causes, it is our duty to employ suitable means to remove those causes and to arrest its progress.16

Having thus discharged our duty, we may repose with confidence upon a power, wisdom and mercy beyond our control or comprehension, to bless our exertions and prayers, by removing from us in due time existing calamities, or by averting those which may threaten.

E. T. THROOP.

Albany, June 21, 1832.

July 2. The Legislature adjourned without day.

---

16 By chapter 333, passed June 22, "for the preservation of the public health," quarantine regulations were to be imposed on vessels coming to New York, from any place in which Asiatic or malignant cholera or any other malignant disease was known to exist. The act also contained provisions relative to the organization of boards of health in different parts of the state, and prescribed details of administration.
CHOLERA AND THE FAIR.

In common with the general public, I am sure also the Editors of the City they at first thought as if a true sorrow. Of course, I have no personal knowledge of the subject, and I am not in a position to express an opinion on it; but I trust that if the authorities are in the right, they will be able to prove it, and that the public will be satisfied with the evidence.

The alleged case of cholera which has occurred at the Fair is, I believe, the first of its kind in this country. I have no information as to the number of cases, or as to the severity of the symptoms. I have been informed that the patients were taken ill on the first day of the Fair. Some of them were severe, and were treated with care and attention. The patients were removed to the hospital at once, and the authorities were notified. I have no information as to the cause of the illness, or as to the treatment which was given. I am informed that the patients were kept under observation for several days, and that they were discharged from the hospital in a healthy condition.

The number of cases is not given in any report, and I have no information as to the number of deaths. I have been informed that there were two deaths, which occurred on the second day of the Fair. I have no information as to the cause of the deaths, or as to the extent of the epidemic. I have been informed that the hospital was placed under the direction of the medical officers of the Fair, and that the patients were treated with care and attention.

I trust that the authorities will be able to give information as to the cause of the illness, and as to the treatment which was given. I am confident that the public will be satisfied with the evidence, and that they will be satisfied with the action of the authorities.

The cases are said to have occurred among the working force of the Fair, and among the visitors. I have no information as to the number of cases among the working force, or as to the number of cases among the visitors. I am informed that the working force of the Fair was vaccinated, and that the visitors were not vaccinated. I have no information as to the extent of the vaccination, or as to the effect of the vaccination.

I have no information as to the cause of the illness, or as to the treatment which was given. I am informed that the patients were kept under observation for several days, and that they were discharged from the hospital in a healthy condition.

I trust that the authorities will be able to give information as to the cause of the illness, and as to the treatment which was given. I am confident that the public will be satisfied with the evidence, and that they will be satisfied with the action of the authorities.

The cases are said to have occurred among the working force of the Fair, and among the visitors. I have no information as to the number of cases among the working force, or as to the number of cases among the visitors. I am informed that the working force of the Fair was vaccinated, and that the visitors were not vaccinated. I have no information as to the extent of the vaccination, or as to the effect of the vaccination.

I have no information as to the cause of the illness, or as to the treatment which was given. I am informed that the patients were kept under observation for several days, and that they were discharged from the hospital in a healthy condition.

I trust that the authorities will be able to give information as to the cause of the illness, and as to the treatment which was given. I am confident that the public will be satisfied with the evidence, and that they will be satisfied with the action of the authorities.
The present aspect of the cholera question.

By Prof. Dr. Max von Pettenkofer, of Munich.

Abstract supplied, by special permission of the Author, by Henry Koplik, of New York. (Concluded from page 30.)

Hirsch, in his work on Historico-Geographic Pathology, has collected a number of facts concerning the Indian epidemics which speak as much in favour of the influence of human intercourse as they do for that of time and locality. The epidemiological facts connected with the course of cholera through long intervals of time and over wide tracts of land show that the spread of the specific cause of cholera through Europe is clearly connected with human intercourse. We could not account for its spread in continuous movement, and why so great a time was included in this spread of the disease. Yet human intercourse does not account for everything in this connexion; time and locality also play an important rôle in this question. The author lays especial stress on the two latter conditions, and endeavours to explain through them the diversity of epidemics in time and place of occurrence. The Contagionists, in rejecting the influence of time and locality, are as one-sided as the Autochthonists, who reject entirely the facts speaking for the influence of human intercourse.

1. Infection of the healthy by the sick. — Contrary to what is found to be true in the case of enzootic infectious diseases (small-pox, typhus, and scarlet fever), physicians in constant attendance on cholera patients are not attacked by the disease more frequently than others who are not. This same phenomenon has been observed among the nursing staff. If cholera were contagious in an enzootic sense, these persons should show a greater mortality than others. The researches of Günther, Bouchardt, Kopp, and Ricord support the above facts. Prof. Pettenkofer has found that in the epidemic in Munich the nurses also were as little subject to the disease as the physicians, though they came in much closer contact with the patients. The nurses, or other persons who are in the vicinity of the patients, become sick, not from an enzootic infectious matter, but from an ectogenetic matter, which either develops in the locality itself or is brought by the patient on his person in sufficient quantity from the cholera district. That intercourse with the patient cannot be put aside as an illusory fact. Prof. Pettenkofer himself once believed that the excreta of cholera patients was a bacterium (comma bacillus). But if we go over the history of epidemics in former times, we see, by the light of present bacteriological researches, that the specific cause of the disease was not to be found in the excreta of the patient. Koch also seemed to support this view. The facts, however, show that the contagionists, in rejecting the influence of time and locality, are as one-sided as the Autochthonists.

2. The excreta of the patient as the seat of infectious matter. — If the cholera patient himself cannot in an enzootic sense produce anything to convey the disease, his excreta also certainly cannot. It is to be expected that, as the intestinal tract is the seat of the principal phenomena of the disease, the specific cause should be found in its excreta. Professor Pettenkofer himself once believed that the stools, if not immediately the seat of infectious matter, could become so by subsequent development in waterclosets and drains. But the numerous experiments of Thiersch seemed to support this view. Koch also has recently discovered that a constant element in the stools of cholera patients is a bacterium ( comma bacillus). But if we go over the history of epidemics in former times, we see, by the light of present bacteriological researches, that the specific cause of the disease was not to be found in the excreta of the patient. Koch also seemed to support this view. The facts, however, show that the contagionists, in rejecting the influence of time and locality, are as one-sided as the Autochthonists.

3. Hospital and barrack epidemics as a proof of the contagiousness of cholera. — In spite of the universally observed fact that comparatively few physicians and nurses, in their attendance on the sick, contract cholera, the probability of the disease being contracted through this avenue has become more and more feared. This has led to the conclusion that hospitals and barrack epidemics are to be explained only by human intercourse. It is to be expected that, as the contagionists have not been able to confirm, in general, the entogenic doctrine of Koch concerning the cholera bacillus. The entogenetic nature of the bacterium, x, is proved by its disposition to develop under favourable conditions of time and locality. Professor Pettenkofer does not accept the principle of Koch concerning the etiological nature of the cholera bacillus. If the disease, it must be because the patient produces a bacterium (comma bacillus). For instance, if in the case of a hospital situated in a cholera district, a bacterium x in the stools is brought by the patient, it must be because the cholera bacterium produces the same phenomenon has been observed among the nursing staff. If cholera were contagious in an enzootic sense, these persons should show a greater mortality than others. The researches of Günther, Bouchardt, Kopp, and Ricord support the above facts. Prof. Pettenkofer has found that in the epidemic in Munich the nurses also were as little subject to the disease as the physicians, though they came in much closer contact with the patients. The nurses, or other persons who are in the vicinity of the patients, become sick, not from an enzootic infectious matter, but from an ectogenetic matter, which either develops in the locality itself or is brought by the patient on his person in sufficient quantity from the cholera district. That intercourse with the patient cannot be put aside as an illusory fact. Prof. Pettenkofer himself once believed that the excreta of cholera patients was a bacterium (comma bacillus). But if we go over the history of epidemics in former times, we see, by the light of present bacteriological researches, that the specific cause of the disease was not to be found in the excreta of the patient. Koch also seemed to support this view. The facts, however, show that the contagionists, in rejecting the influence of time and locality, are as one-sided as the Autochthonists.

2. The excreta of the patient as the seat of infectious matter. — If the cholera patient himself cannot in an enzootic sense produce anything to convey the disease, his excreta also certainly cannot. It is to be expected that, as the intestinal tract is the seat of the principal phenomena of the disease, the specific cause should be found in its excreta. Professor Pettenkofer himself once believed that the stools, if not immediately the seat of infectious matter, could become so by subsequent development in waterclosets and drains. But the numerous experiments of Thiersch seemed to support this view. Koch also has recently discovered that a constant element in the stools of cholera patients is a bacterium ( comma bacillus). But if we go over the history of epidemics in former times, we see, by the light of present bacteriological researches, that the specific cause of the disease was not to be found in the excreta of the patient. Koch also seemed to support this view. The facts, however, show that the contagionists, in rejecting the influence of time and locality, are as one-sided as the Autochthonists.
If we believe that the excrement of cholera patients is a source of infection, we must also believe that clothing soiled with the same is a source of infection. Professor Pettenkofer, who, with certain reservations, maintains that fact, would seem to strengthen the belief that soiled clothing is an autogenous source of infection. Koch, in explaining the striking immunity of Lyons from cholera, attributes this to the fact that 300 ships out of the 150,197 that left the infected districts and localities of Europe to New York, only four of these ships had cholera on board. An interesting instance of these four is the Westphalia from Hamburg, which had 26 cases of cholera on board in booths situated on the banks of the Seine and Rhone. But at this time there were about 1000 cases of cholera in the city of Lyons; and it is possible also that the epidemic in Capronne was due, not to the stained linen in an entogenic soil, but to a something adhering to the linen which, ectogenic in its nature, was thus conveyed from Lyons to Capronne. Moreover, such carriers of germs may be other articles than linen. It is not an absolute condition that such clothes be washed by others to convey the disease. Cases exist where clothes simply handled in localities and at times favourably disposed have conveyed the disease. If such clothes, for a time, were soiled or infected, they might be more infecting than healthy persons coming from the same place, it must be because the sick person has come into closer contact with the local ectogenetic infectious matter. But healthy persons coming from cholera districts may also be carriers of the disease, not as Drasche and Monod, who attribute such a long period of incubation to healthy persons coming from centres of disease, to a something pathological in the blood, but to a contagious matter adhering to the clothes. The author, while admitting that clothes from cholera districts can cause "sporadic infections," denies that epidemics can result from such cause alone. In this connexion the author cannot agree with those, as Drasche and Monod—who attribute such a short period of incubation to healthy persons coming from centres of disease, as they are considered in Munich epidemiologically, was divided into two varieties of cases: (a) A person coming from a locality free from cholera to an infected spot was attacked within two or three days. (b) A person coming from a cholera district to one free from it, the next case resulting appeared within six or seven days.

The Autochthonists do not believe in or admit the agency of human intercourse in the spread of cholera on land. Cunnington and Lawson in India, and in the days previous to the introduction of railways, in Saxony, we should see that cholera only favours special localities and avoids others. Railroads have changed nothing in the direction of the spread of cholera in Saxony different directions from cholera-infected spots, and some die on their journey. But, independently of this fact, the epidemics always take a certain route. In places lying outside the line of route the cholera patients cause no epidemics, but in the epidemic direction they appear to be infectious. In studying the map of Europe, we find that the cholera epidemics do not in the least spread in the lines of travel. If we were to make a topographical map of the spread of cholera in Saxony, we should see that cholera is distributed more rapidly to-day than in the days previous to the introduction of railways. Cunningham in India and Gintner and Rheinhard in Saxony have shown that cholera does not spread in the direction of the railways. If, then, cases of cholera in a cholera district to one not infected, and cases
follow his arrival in the new locality, or even when epidemics reappeared. Is there anything at this point which argues that the arrival of the first case and the outbreak of cholera in the new locality may be simply accidental, or be due to germs carried into this locality at another time and until now latent. The mobilisation of troops in a cholera locality, combined with the want which they bring with them, and also the interplay of these subsequently became the seat of epidemics; in others the disease appeared sporadically, and in twenty-three not one but all. It is only where the cholera germ finds a favourable soil that it develops and causes an epidemic. That intercourse has some influence in the spread of cholera is not denied by the author. It has not the great influence attributed to it by the Contagionists.

GENTLEMEN,—It must be the desire of any man who is honoured by the commission which I hold to day to say something which may be useful as well as acceptable to his audience. If you were listening to some member of your own great profession, you would doubtless expect some addition to your knowledge, derived from his insight and experience. You will now of course expect no such benefit. I have nothing to tell you that you do not know already. If I am able in any way to interest you, it will be because sympathy and respect can never be wholly disagreeable to those who receive them. Let me then, at once try to find out at least one topic common to us all. My experience of life has lain chiefly with the young. I love to think of young men at the beginning of their career, while still a little sicklied o'er" with the pallor of "hope deferred," of assured success. They are less interesting to me in what precedes them, or of sheer professional perseverance brings out powers of originality conspicuous; how a sense of duty, or of ambition, or of mere pride of origin, is developed; how the experience of failure in the House of Commons, striking his head and clenching his fists, with the consciousness of power, "I, too, am a man," and have the confidence of being able to do the thing that you desire. But I confess I find something even more stimulating in reading—first, the humorous praise given by a surgeon of "an artist whose ideal of excellence is surpassingly high and exacting? or was this great surgeon really right in his statement?—"I had the organ of constructiveness much developed, and the use of my hands, and it was only by taking great pains at the periphery of the world, a clear and sober judgment, an acute moral sense, and an absolute rectitude of purpose. Further, he must have the gifts which attract and inspire affection. Much of the power which doctors so happily wield in families is, I cannot doubt, to be set down to the circumstances of their patients. The ear of the physician is the modern confessional. Who is afraid to trust him, if he be worthy of trust? What insight gains into family histories, into the causes which prevent men from being of one mind in a house, the secret humiliations concealed beneath a bold front, of the patient heroes, of the unsuspected sins and even crimes, of the daily tragedies under roofs which to the world at large seem a very temple of prosperity. The thought that I would endeavour to leave with you, my younger friends, is this: If such is to be your position hereafter, what manner of persons ought you to be now in preparing yourselves for so high a trust? The qualifications of which, I think, are much the same, although the period of preparation is. The characteristic of the physician not only all that gives richness to the intellect, but all that gives grace and beauty to moral worth. For, consider how much is required by one who is to be the confidential friend and almost confessor of hundreds of families. He must have in a high degree the gift of sympathy first implanted by nature and then systematically trained. He must have, further, wide knowledge of the world, a clear and Resize judgment, an acute moral sense, and an absolute rectitude of purpose. Further, he must have the gifts which attract and inspire affection. Much of the power which doctors so happily wield in families is, I cannot doubt, to be set down to the circumstances of their patients. The ear of the physician is the modern confessional. Who is afraid to trust him, if he be worthy of trust? What insight gains into family histories, into the causes which prevent men from being of one mind in a house, the secret humiliations concealed beneath a bold front, of the patient heroes, of the unsuspected sins and even crimes, of the daily tragedies under roofs which to the world at large seem a very temple of prosperity. The thought that I would endeavour to leave with you, my younger friends, is this: If such is to be your position hereafter, what manner of persons ought you to be now in preparing yourselves for so high a trust? The qualifications of which, I think, are much the same, although the period of preparation is...
than in the other, will produce anaesthesia in both sides of the body, but in a greater degree in the side opposite to that side of the cord where the lesion is most extensive.

On the contrary, there was a lesion extending to both sides in Cases 3, 6, 7, 8, 9, and 10.

3rd. A lesion in one side of the spinal cord produces a paralysis in the opposite side.—We are not much advanced yet, as regards the physiological and pathological history of the muscular sense. We do know, however, that the conductors serving to give us an accurate notion of the state of contraction of our muscles are absolutely distinct from the conductors which give us the variety of painful sensations we may receive from these contractile organs. We know, also, that in cases in which an autopsy has been made, and the spinal cord found injured or diseased in one of its lateral halves, there was no alteration of the muscular sense in the parts that were not paralysed; and as the paralysis was on the side of the lesion in the spinal marrow, it is clear that the conductors serving to the muscular sense do not decussate in this lower or in other parts of the trunk and limbs. The conductors serving for the muscular sense behave just like the voluntary motor conductors, and seem to follow exactly the same course in the spinal marrow. These two sets of conductors, I repeat, do not decussate in that organ; while, on the contrary, the conductors of impressions of tickling, of touch, of pain, and of temperature, all decussate before reaching the base of the brain.

I can conclude, therefore, that in the cases I have related in which the muscular sense was lost or diminished, in one side of the body (Cases 1, 2, 3, 4, and 7, in THE LANCET, Nov. and Dec. 1868), there was a lesion in the corresponding side of the spinal cord.

SCIENTIFIC INVESTIGATION INTO THE CAUSES OF CHOLERA.

1. A REPORT OF INTERVIEWS WITH PROF. MAX VON PETTENKOFER AT MUNICH, Nov. 1868.

By Dr. D. DOUGLAS CUNNINGHAM

and Dr. TIMOTHY LEWIS.

[This and the two subsequent reports on interviews with Professors De Bary and Hallier were kindly placed at our disposal by the Director-General of the Army Medical Department. The writers, Dr. Cunningham, of the Indian Medical Service, and Dr. Lewis, of the British Medical Service, having passed through the Army Medical School with great distinction, were selected by the Senate of the School for special service in India, in connexion with a thorough investigation of cholera which has been lately ordered by the Government. Before proceeding to India it was thought desirable that they should receive special instruction on the methods of investigating the forms of fungi, (as much information has been gathered to this point,) and they were accordingly directed to go to Halle and Jena to see Professors De Bary and Hallier. Subsequently they proceeded to Munich to talk over the best methods of investigating cholera with Professor Von Pettenkofer. On returning home they presented short reports of their interviews, which, as expressing the latest views on the subject of cholera and of the fungoid theory of these eminent German Professors, will doubtless be interesting to our readers.

We publish the Report on the interviews with Professor Pettenkofer this week, and those with Professors De Bary and Hallier shall follow. The Director-General informs us that nothing could exceed the interest the German Professors took in the inquiry, and they showed the greatest kindness in discussing the subject with the two gentlemen. The same may be said also of the Rev. Mr. Berkeley, Mr. Hurley, Mr. Simon, Dr. Thomas Thomson, Dr. Burdon-Sanderson, and others in this country, who all most kindly gave Drs. Cunningham and Lewis the benefit of their suggestions.—Ed. L.]

During our stay at Munich Professor Pettenkofer went over the subject of cholera with great care, and at the close of our interviews with him made the following statements as a summary of his views:

In my opinion four conditions (momenta) are essential in order to bring about an epidemic of cholera:

1. A specific germ.
2. Certain local conditions.
3. Certain seasonal conditions.
4. Certain individual conditions.

I have not investigated the nature of the cholera germ as disseminated by human intercourse. I have only taken for granted that it exists in the intestinal discharges of persons coming from infected places. (Vide "Untersuchungen über die Verbreitungsart der Cholera," Munchen, 1855.) My own investigations have been chiefly confined to the second and third before-mentioned conditions. Hitherto I have considered the human subject only so far as he is the bearer of the infecting matter of cholera, or of the germ of this matter; and have with facts contended against the pure contagionists, who declare that the infecting matter is produced by a process of multiplication within the bodies of those affected by the disease. My chief proofs of this have always lain in simple facts (independent of any theory) as to the spread of cholera over large districts. (See, for example, maps No. 8 and 11 in the Bavarian Cholera Report.) There are certainly places enjoying complete immunity from cholera, also periods of immunity. (Refer to my article on the Immunity of Lyons from Cholera, and the occurrence of Cholera on board ships, "Zeitschrift für Biologie," Bd. iv., 404-414.)

The development of epidemics, and the immunity of many places, is totally inexplicable by the simple assumption of contagion from person to person. Observe the spread of epidemics along the course of railways and other ways of intercommunication indicated in the above-named maps. Nor are they to be explained by certain individual dispositions of persons (food, drinks, domestic arrangements, &c.); but the circumstances require, besides these, the existence of local and seasonal aiding causes, which have to be assumed.

Are these in immediate relation to the cholera germ itself, or to the individual disposition? Facts speak in favour of the first opinion only. 1. Persons from an unaffected place going to an infected one, are attacked quite asnumerously and as soon as the persons who constantly reside in these places. 2. Cases are on record where a person from an infected district conveys (in a way not yet clearly ascertained) infecting matter into a place enjoying complete immunity from cholera; and there, by means of this limited amount of infecting matter, infects a few persons who themselves had never been subject to the local conditions of an infected place, and therefore could not have had their individual dispositions altered by it. (See the article on Lyons, where the statistical example of cases of cholera in Stuttgart in connexion with the cholera in Munich are recorded, pp. 424 to 426; see also cases recorded of persons infected on board ship who had not been on land, p. 428.) Facts multiply demand a distinction between "general" and "local" conditions intimately connected with the cholera germ, although they may in addition be in a condition to act on the individual predisposition also. The infecting matter, in my opinion, is not a product of the human intestines, but of the soil. In so far as we consider the cholera germ of an organised nature, and capable of various degrees of development, it is possible—nay, very
probable—that there may be various degrees of infection. The distinction between choleli "gern" and choleli "infecting matter" must be noted. The choleli germ stands in the same relation to the infecting matter as the seed does to the fully developed plant.

In order to carry out a rational investigation of the special properties of the vegetable and animal substances, we must first determine the local and seasonal conditions of choleli epidemics. This is absolutely necessary, for it is only thus that one can find where and when this infecting matter is to be sought with any prospect of success.

The differences in the local and seasonal occurrences of cholera are at present the only substantial grounds for inferring the existence of a specific choleli germ and infecting matter. Exact statistics of the local and seasonal movement of choleli are indispensable. (Vide the tables concerning Bavaria in the Bavarian Report, p. 50.)

Closer examinations of isolated cholera places disclose that even in those more limited areas as great differences exist in the local conditions (proportionately) as in entire countries and provinces. (Examples of such are given in his article on Lyons, p. 464, and in Pfeiffer's article on Weimar in "Zeitschrift für Biologie," part iii., p. 189.)

Whatever has hitherto been advanced against the view that the soil exercises an essential influence on the spread of choleli epidemics has proved unsatisfactory on closer examination; in illustration of which refer to pages 91 and 98 in the Bavarian Report on Kiemberg, and to the remarks of Dr. Sutherland on the condition of the soil at Gibraltar and Malta in the Sanitary Reports.

The seasonable disposition to cholera consists, in my opinion, in a certain degree of humidity combined with warmth of the soil. Refer to the article on Lyons, pp. 465-468. Note the definition of "ground water" in pp. 468,469; also a description of the influence of the rain season in Calcutta, Bombay, and Agra, in pp. 469-477, as well as the remarks on the influence of the climate on that portion of Lyons which is situated on alluvium, p. 484.

Here I may also allude to the evidence establishing the connexion which existed between the ground water and the soil of the cholera places. When the former was at its lowest level, the latter reached the highest. (Vide article on the subject of the "soil," p. 92-97.)

Individual predisposition consists, in my opinion, as a rule, in a proportionately excessive amount of water in the tissues of man, and a deficiency of albumen. This subject is treated at length in "Zeitschrift für Biologie," part iii., pp. 189-190.

In illustrating these views, the Professor referred to some instances of a demagnetization as to the grounds on which they are founded. In doing this he showed practically the method of estimating the percentage of the porosity of the tissue of organs, and a deficiency of albumen. This subject is treated at length in "Zeitschrift für Biologie," part ii., pp. 92-97.

On THE NUTRITIVE VALUE OF DIFFERENT SORTS OF FOOD.

By BARON LIEBIG.

It has been said that if man could live on air and water, there would be an end at once of the notions master and servant, sovereign and subject, friend and foe, hatred and affection, virtue and vice, right and wrong, &c., and that our subject is treated at length in the question why in reality man eats and drinks, and what science,—in short, all that makes man what he is, would not be influenced by taking up life in the way it is performed, and facts which everyone can observe in his own person. But what we do not comprehend is, that in spite of this renovation, our body does not remain as it was, but gradually dies away. We know life and death, but of the processes that take place, we are quite ignorant.

Food does not serve to generate warmth and force only, as is the case with the steam-engine, but also to form and to increase the quickened parts of the animal body, and to reproduce those which have been destroyed.

If we keep in view these different purposes which food serves, it will be easy for us to form a decided notion of the nutritive value of different sorts of food. Physiology teaches us that all animated and plastic parts of the body, as well as inanimate, are turned into heat. It is only thus that one can find where and when this infecting matter is to be sought with any prospect of success.

The component parts of human food and of the fodder of animals which are free of nitrogen, such as fat, starch, sugar, sugar of milk, &c., are applied in the vital process, principally in part assimilating substances, for the formation of the blood, and that the component part of blood, which becomes fluid when heated, and is called albumen, is the material which serves for their construction.

All the different sorts of food of man, as well as that of animals, contain, in addition to substances which are identical, or nearly identical, with the albumen of blood. This constitutes an entire group of substances found in plants, partly in solution in the juices, partly deposed in the seeds, which are found in all the animal bodies, and which name given them is albuminate. In the nutritive process, albumen of the blood is formed from them; they are also called constituent nutritive substances, because they furnish the material for the formation of all the plastic parts of the body. From other organic substances they are materially distinguished, having an abundance of nitrogen, and by containing a certain amount of sulphur. The cheesy substance (casein) of milk; synthon, the principal component part of the muscles; albumen, or that part of vegetable and animal juices which is soluble in heat; gluten of the cereals; vegetable casein in peas, beans, and lentils (legumin), all belong to the group of albuminates.

The component parts of human food and of the fodder of animals which are free of nitrogen, such as fat, starch, sugar, sugar of milk, &c., are applied in the vital process, principally in part assimilating substances, for the formation of the blood. They have been named respiratory substances, or warm-generating substances. The food of men and animals contains, besides, a third class of nutritive substances, known as nutritive salts. These are the substances which furnish, in the form of ashes when the articles of food are burned: phosphoric acid, potash, lime, magnesia, iron, common salt, are their chief elements.

Albuminates and heat-giving substances are quite incapable of nourishing and of sustaining life if the nutritive salts are not present, and co-operating with them. Without the nutritive salts they do not give nutrition. The idea of a perfect sort of food must be associated with three conditions; it must contain a certain quantity of albuminates, heat-giving substances must also be a certain proportion of heat-giving substances, and of nutritive salts. We may accordingly speak of meat,
in addition, but she could not do it, and the figures were meaningless hieroglyphics to her. She said she could not read, and could not understand anything; yet she knew the words which were actually under her eyes, but always when she reached any one word she had quite forgotten those that preceded it, and hence could not catch the meaning of even the shortest sentence. She could not name anything she saw, but had great difficulty in recalling the names of things which were not present or visible. I saw her again about nine months later. I learnt then that all her symptoms had disappeared in the course of a few months, but that the dull spasmodic twitching of the face had returned. She had had recurrence of all the old spasmodic twitching of the facial muscles, all the old difficulty in writing and in the recognition of letters, and all the old forgetfulness of names of things not before her. She could not recollect the name of the day or of the month, and she told me that a few days previously she had had, as she thought, a serious and interesting conversation with a lady whom she knew, and who called upon her next day and asked her if she had not been ill, for she had talked nothing but nonsense. The patient had occasional attacks of unconsciousness, which, for anything I know to the contrary, may have been either attacks of true epilepsy or genuine syncope; but I have no sufficient reason, however, for doubting that the case was essentially one of hysteria; and that was, I believe, the view of the medical man under whose charge she was.

(To be concluded.)

REMARKS UPON THE CHOLERA BACILLUS OF KOCH.

By EDGAR M. CROOKSHANK, M.B.LOND.

The works of Koch and his collaborators, of Hueppe, Johnne, Babes, and others, have made us acquainted with the most recent and trustworthy methods of bacteriological research, which are of such especial importance in enabling us to decide the burning question of the present day—the etiology of Asiatic cholera. The interest in the discovery by Koch of a cholera bacillus, and in his methods of its investigation, is increased by the approach of summer and the possibility of a fresh outbreak in Europe. Consequently the attention of the profession and of the scientific world has been drawn to this subject throughout Germany, Italy, Spain, and France—in fact, almost everywhere; while this interest has been greatly increased by the reports of America in the demands in the medical journals for a thorough acquaintance with scientific bacterioscopy, and in this country in the recent discussion at the Royal Medical and Chirurgical Society. The result of this discussion, however, though convincing to those who know how to appreciate the importance of the arguments brought forward by Watson Cheyne, Heron, and Warden, is in several respects very unsatisfactory, more especially for those who do not fully realise the minute and searching methods employed in bacteriological research by the school of Koch, and in the face of contradictory opinions the medical public remains without any guide. Having through the kindness of Professor Joseph Lister, F.R.S., the Pathologist of the Barony of Babes in the pathological Institute at Berlin, and for some time almost entirely restricted my attention to the study of the comma bacillus, it is my aim in these remarks, by describing in the simplest form possible the methods employed, to enable all to judge for themselves, and, I trust, not only to appreciate, but to be convinced of, the searching arguments brought forward by Koch to prove the essential rôle of this micro-organism in the causation of the disease, and to prove beyond all possibility of doubt the true etiology of Asiatic cholera. By reference also to some of the most recent researches, and by commenting upon some of the points raised at the above-mentioned debate, one can clear up many difficulties which lie in the way of accepting the conclusions of Koch. Those who are acquainted with Koch's comma bacillus can easily demonstrate its presence in the intestine in all cases of true cholera. Hitherto nearly one thousand cases have been examined by capable observers, and have given positive results; and there does not exist one observation which is contradictory, nor can one find the same mircobes in other maladies. Physicians can therefore accept the presence of the comma bacillus of Koch as a pathognomonic sign of cholera, and I believe it is not too great a step for those who have become acquainted with its nature. The character of the comma bacillus is manifested in its habitat, its form, its cultivation, and its pathological action. The morphological character of the organism has been described in the writings of Koch and in the reports of the Berlin Cholera Conferences, and need not be repeated; but inasmuch as it is often difficult to distinguish other bacilli which are present in the excreta from the bowels and resemble more or less in microscopic appearance any bacillus essential to become familiar with the methods of pure culture which have been employed by Koch.

It is necessary, however, to obtain a characteristic culture, always to employ a 10 per cent. gelatine, slightly alkaline (Babes), and as it is difficult to prepare, it would be best to procure it ready made. Provided, then, with ready prepared sterilised tubes, a platinum needle (two or three inches of fine platinum wire fixed at the end of a glass rod), a few dinner- and soup-plates, half a dozen small panes of glass (6 in. by 4), a solution of sublimate (1 in 1000), a common dinner knife, some potatoes, methyl violet, a microscope, and its usual appendages, a spirit lamp, and a dozen small panes of glass (6 in. by 4), a solution of sublimate, a common dinner knife in two tubes, and introduce into one by means of the platinum needle a mucous colloidal jelly made by mixing some cholera patients' stool with a little sublimate. From this inoculate the second tube by introducing the needle five times, and stirring round as before. Lastly, pour the gelatine on the plates in the form of a ring, so that every part can be brought into the field of the microscope. At a temperature of from 16° to 20° C. little specks commence to be visible in about twenty-four hours. They consist of isolated colonies, and when examined with a low power and a small disphragm have the following characteristics. They appear as little masses of granular, and slightly vesicle, and of a faintly yellowish-red tinge. They liquefy the gelatine, sink down, making a little excavation, at the bottom of which one recognises the little punctiform colony. By means of the platinum needle, when the gelatine has become white in appearance, from the bottom of the curved part of the needle, and under the power of the microscope, select and pick out a typical colony and inocate a tube. Another colony can be selected in the same way and well spread out with a needle on a cover glass, and stained after the method of Babes. This consists in putting on the cover glass so prepared a drop of a weak aqueous solution of methyl violet (b) and leaving it for a minute; then place the cover glass on a slide, and with filter paper remove the excess of liquid, and examine. A rapid examination is thus made of a pure culture of the bacilli. In about twenty-four hours the tube-culture commences to display its absolutely distinctive appearance. Liquefaction sets in slowly, commencing at the top, and in five or six days the whole of the gelatine underneath it is liquefied. Babes has shown that the cultivation on an oblique surface of agar—butter at 48° C., and exposed to ordinary atmospheric conditions, which disappears only at the moment when all the rest of the gelatine underneath it is liquefied. Babes has shown that the cultivation on an oblique surface of agar—butter at 48° C., and exposed to ordinary atmospheric conditions, which disappears only at the moment when all the rest of the gelatine underneath it is liquefied. Babes has shown that the cultivation on an oblique surface of agar—butter at 48° C., and exposed to ordinary atmospheric conditions, which disappears only at the moment when all the rest of the gelatine underneath it is liquefied.
putrid infection. In the intestine, in the mucus typical bacillus in animals. Nicati, Rietsch, Koch, Ermengen, and Babes have inoculated the bacilli with success in the post-mortem examination the appearances produced by cholera without any trace whatever of peritonitis or accidental infection, but it is easy to be convinced that if one does avoid these errors one will have a certain number of cases which give positive results. That Dr. Klein has so often encountered accidental infection may account for his want of success. Emmerich has asserted that he has found in the internal organs a special microbe which causes choleraic symptoms by inoculation. This, however, is in direct contradiction to all other observers, who have shown, like Babes, that if there be a pathogenic microbe present in the organs, it has penetrated through the necrosed tissue of the intestine, and that it is nothing more nor less than a pyogenic or septicemic bacterium.

Other comma bacilli differ in that they cannot be cultivated on gelatine, with the exception of a comma bacillus very frequently found in water. This liquefies gelatine very slowly, and forms on its surface a white pellicle (Babes). The last link in the chain of evidence is afforded by the isolation of a pure culture of Koch's comma bacillus on agar plates the Finkler bacillus grows rapidly at the ordinary temperature of the air, the culture has a brownish colour. On agar the Finkler bacillus forms a white layer much more quickly; the liquid at the bottom of the oblique surface also appears to be eaten in.

Ferrocyanic Test Pellets for Albumen.

Ferrocyanic test pellets foralbumen.

These pellets afford a ready, portable, reliable, and delicate clinical test for albumen. They require no spirit lamp to be employed and supply information which can be accepted without needing the application of any other test for correction or corroborating. When albumen is present it does not fail to be indicated by the production of a precipitate; and, on the other hand, when a precipitate is produced, albumen is present, as far as I yet know, is the only principle for correction or corroboration. When albumen is present in the urine it can be detected by the use of this test. The sketch on the following page shows the portable character of what is needed for the application of the test. The whole appliance consists of a pocket-piece (A), in which the test is carried, and a small test tube (B), which is employed as the test tube. No other reagent is required for the test, and the test can be applied without need of any other reagents. These pellets are of the character of a pure culture of the ferrocyanic test itself, and are adapted for general use in medical practice.