

Surely ours is a world well worth living in,—a world of joy and beauty, which well may inspire us to look from nature up to nature's God; a world of which the poet says:—

“The poetry of earth is never dead
When all the birds are faint with the hot sun,
And hide in cooling trees—a voice will run
From hedge to hedge about the new-mown mead.”

Many of the evils which the pessimists believe to be irremediable are in reality within man's power to lessen or destroy. Not a few of them arise from systematic violations of the laws of life and health. We can hardly be clean in our minds if we are foul in our bodies. We should keep corruption as far from us as possible. Let us dwell in the freshness of things, remembering always that filth is synonymous with disease and death. Let us worship at the shrine of that goddess who has given a name to the noblest of the sciences—that which relates to the preservation and improvement of that precious porcelain of man's body. Hygeia is depicted as not only beautiful but strong and vigorous, typical of what the human form ought to be. A great American poet says of her:—

“The leaden footsteps of care
Leap to the tune of her pace,
Fairest of all that is fair;
Grace at the heart of all grace!
Sweet'ner of hut and of hall,
Bringer of life out of naught—
Hygeia, oh fairest of all
The daughters of time and thought!”

SECTION I. SANITARY SCIENCE & PREVENTIVE MEDICINE.

ADDRESS,

By PROF. J. LANE NOTTER, M.A., M.D., D.P.H.

PRESIDENT OF THE SECTION.

My first duty to-day is to thank the Council of The Sanitary Institute for the honour they have conferred on me in inviting me to preside over this section of the Congress.

It is an honour which I wish had been placed in abler hands than mine, and I must crave your indulgence for a short time while I offer a few observations on the causes and prevention of cholera, a disease which threatens in its onward march to visit our shores, and that at no distant date.

There is a certain area, bounded by more or less definite limits, wherein cholera is always endemic in India. This is comprised between the base of the Himalayas on the north, and the Bay of Bengal on the south; the north-west and central provinces on the west, China and northern Burmah on the east. Within this area is located the delta of the united waters of the Ganges and Brahmaputra. Whether this is the only endemic area is a question which I shall have to refer to again. And here let me briefly review the climatic state of this region. Traversed from north to south by the most uncertain and most impetuous river in the world, Bengal proper, or the true delta of the Ganges, is a mere alluvium, deposited, as it would appear, in a vast estuary, into which this great river poured forth his earth-laden water.

History tells us that within a comparatively short period this river has wandered out of one course into another, throughout an extensive tract of country, nearly every part of which has in consequence been left, virtually, in a condition of newly deposited land. Floods and heavy rains leave this flat and

rivulet-broken soil in a condition of moisture, with the most profuse vegetation in the damp season, while during the long season, in which scarcely one drop of rain falls, the thin layer of loam covering the vast sand-bank of which the country is composed, becomes almost entirely destitute of moisture.

Throughout nearly the whole of the year there glares down upon this plain the almost vertical blaze of an inter-tropical sun. One can well understand that here an opportunity is afforded for the development and maturation of micro-organisms amid the dense vegetable and animal products exposed to every influence that most favours decomposition. And it was from the inundated rice-fields of Jessore, lying on the borders of this tract, that arose in 1817, as an epidemic, the plague of cholera which is again manifestly gathering fresh energy as it proceeds on its westward course.

Let us now pass on to some of the conditions favourable to the origin and spread of this disease.

It may be laid down as an absolute rule in reference to cholera that its epidemic occurrence in any one place implies, besides importation of the contagium, certain local conditions, these being:—

- (a.) General sanitary defects.
- (b.) Peculiarities of climate.
- (c.) Peculiarities of soil.

The history of epidemics in India and in Europe teach us that universally filthy surroundings accompany outbreaks of cholera all over the world, and it can be readily understood why it is next to impossible to control an outbreak where such favourable conditions exist for the development of an epidemic after the importation of the seeds of the disease. This holds good for cholera wherever we meet it. To anyone acquainted with Eastern habits it is easy to conceive how any infectious disease is conveyable by water, or by milk adulterated with it. With hardly any exception in Eastern cities the drinking water is subject to all sorts of contaminations, and in villages is little better than diluted sewage. As to any system of conservancy outside the principal towns and cantonments there is none.

Those who have visited Kashmir, where cholera has recently been raging, can easily understand an epidemic occurring there. Srinagar, the capital of the state, has no sewers, but rivulets of water flow down the open gutters into which are passed the night soil and other filth of the population, except such as is, still more unfortunately, thrown into open cesspools in back-yards and areas, which become nests of infection. The water supply is taken from the river banks where it receives the sewage of the town.

If filth alone could *create* cholera Srinagar would breed an epidemic every summer; but surface sewage, narrow filthy streets, and a polluted river offer a ready and fertile hot-bed for the propagation of this disease when once imported.

Wherever there has been a recurrence of cholera the same monotonous conditions exist; revolting contamination of the drinking water and the utter negligence in the disposal of excrementitious matters. And while we in England trust to sanitary measures for protection against the invader, the question asked is: are we safe in depending on such means of protection as we have as yet enforced? Have we no unhealthy quarters in our crowded cities which the mass of the population resort to for labour, and for the excitement incidental to city life? Have we no defects in our drainage systems and methods of removal of animal waste? Is our water supply above suspicion? Is not the aggregation of human beings on limited areas a source of danger, and especially so when among those are numbered the idle and dissolute, the loafers, the street arabs, and casuals, who congregate in certain quarters and huddle together in foul rooms—unfortunates who cannot escape the results of their physical organization?

And if such is the case are those who are officially responsible for watching over the public health doing all they ought to do to afford us protection. We have abolished quarantine—and I think wisely—and have thrown the gates wide open to every invader. Can we prove that we may have reliance on such measures? that there are no weak points in our sanitary administration?

With the full knowledge of the responsibility attached to the position I hold as your President, I would earnestly and in all seriousness impress on sanitary authorities the importance of setting their house in order, or surely there will be a deadly reckoning to avenge for past neglect. It is true that in this country people have been provided at a vast cost with some of the essentials of a healthy life, but it is equally true that in our large cities the "bitter cry of outcast London" is, in some respects, as applicable as it was nigh fifty years ago.

"Is it well that while we range with science glorying in the time,
City children soak and blacken soul and sense in city slime?
There the master scrimps his haggard seamstress of her daily bread.
There the single sordid attic holds the living and the dead.
There the smouldering fire of fever creeps along the rotten floor,
And the crowded couch of incest in the warrens of the poor."

As regards climate in the non-epidemic areas, the epidemic spreading of cholera occurs during the rainy and warm seasons.

I shall endeavour further on to show what factors specially are concerned in producing variations in the amount of cholera. There can be no doubt that a relatively high temperature favours the production of cholera. Warmth, and up to a certain degree moisture, are the physical conditions which, combined, above all others foster the development of the specific poison.

The last condition, namely, the peculiarities of soil which favour the spread of cholera is not by any means the least important factor.

We find that from the earliest records of the disease a remarkable fact has been noted, viz.: That cholera has always attained its widest diffusion and its greatest intensity in those localities which are distinguished by a certain physical soil character, namely, permeability to water and air, and on those kinds of rocks which have a large capacity for retaining the moisture which has fallen upon them.

A careful study of the literature of the disease indicates that in considering the incidence of cholera upon any particular soil, it is not the geological character of the soil itself, but the saturation dependent thereon in which the true explanation of this phenomena is largely to be sought, but even this does not cover the whole case, for it again is affected by the soil heat, rainfall, sub-soil water level, soil air and the general climatic influences, to say nothing of the nature and quantity of the organic matter in the soil.

There appears to be no doubt that a relatively high temperature, both of air and soil, materially favours the production of cholera; in the case of air, this is not shown so much by the prevalence of the disease at times of maximum temperature, as in the absolute abatement or extinction of an epidemic with a fall in atmospheric temperature.

On the other hand from facts which have been slowly and laboriously collected, concerning the soil temperature in various parts of India where cholera is more or less endemic, we find that a high temperature of the soil corresponds differently, yet more closely with the course of cholera prevalence than does that of air.

The credit of the earliest and most systematic attention to this point belongs to Lewis and Cunningham, who in 1876 made a most valuable series of observations on soil temperature in Calcutta. They found that at a depth of six feet from the surface a soil heat of between 78° and 79° Fahr. corresponds with the maximum prevalence of cholera, and that the soil temperature at Calcutta is higher than that of the atmosphere during the cold season. More recent observations in the Punjab, by Firth, confirm Lewis and Cunningham's results.

So much for soil heat; but as concerns soil moisture, as affected by rainfall, we find that in Calcutta, as well as in all endemic areas, the maximum of cholera falls in the dry season (October to May) and more particularly in that part of it which is at the same time the season of greatest heat (March to May).

In the non-endemic area we find some points of resemblance and some of contrast to those offered by the endemic area.

The more the whole history of cholera outbreaks both in India and elsewhere is studied, the more hopeless seem the inconsistencies in its behaviour with reference to rainfall and soil moisture.

They will appear less glaring however and become more intelligible if it be borne in mind that rainfall as a causal element is purely indirect through the soil. Soil moisture is not only a question of so much or so little rainfall, but also of the physical character and saturation point of the soil, to say nothing of the state and level of the subsoil water. It is obvious that when the subsoil water level is low, copious rains will produce an effect quite different from that of moderate rain when the subterranean water level is high, and *vice versa*, and that this result again will be further varied according as the soil is a highly porous one (sand) or a moderately porous one (loam or marl).

Chiefly owing to the writings of Pettenkofer much attention has been given to this question of subsoil water level and its bearing on cholera prevalence, particularly in India, where Lewis and Cunningham made systematic observations for eight years in and around Calcutta.

Their work on the whole showed that in Calcutta the prevalence of cholera is associated with a low level of the soil water. Observations in India go so far as to show also that where the water level is high, no marked outbreaks of cholera occur.

The subsoil water level must be looked at in the light of an index to the changes in soil humidity, from mere moisture to actual saturation of the overlying soil strata, as well influencing the question of soil ventilation. In regard to this latter factor, although our methods of estimating it are imperfect, and with reference to non-endemic localities our data are meagre, still, in the true endemic area, as Lewis and Cunningham indicated, degrees of soil ventilation seem to bear a direct relationship to cholera prevalence, and moreover, as will be shown subsequently, offer a clue to the connection of this disease with soil.

A careful analysis of the writings of Lewis and Cunningham, Pettenkofer and others, based on evidence gathered partly from the endemic home of cholera in Lower Bengal and other parts of

India, as well as from other countries in which the disease has prevailed as an epidemic, indicates to us that the only soil states which appear to bear any constancy to cholera are: (1.) Porosity and permeability. (2.) An average soil heat of 79° Fahr. at six feet deep. (3.) A low level of the subsoil water.

This clears the ground, somewhat, but it remains still to enquire what evidence is offered by the soil itself as to the existence of what all unite in considering does exist—the specific organic cause of cholera.

Elaborate microscopical examinations of soil from various parts where the disease exists, both endemically and epidemically, have been made, but mainly with negative results.

Notwithstanding the outcome of all research on these lines the consensus of opinion is in favour of the theory that the comma bacilli, so constantly found in cholera dejecta, are closely connected with the specific cause of the disease, even if they are not the specific cause itself.

Though the bacilli have been very rarely found in soils, yet many observations have been made regarding their behaviour in both water and soil. Dr. D. D. Cunningham, of Calcutta, made an elaborate series of observations on these points. All experimental facts seem to indicate that the so-called choleraic commas are extremely feeble in the struggle for existence when gaining access to ordinary soil and tend rapidly to die out. This question, however, is not quite so simple as this would seem; and is further complicated by the fact that the more one studies this subject the more convinced one gets that in all likelihood there is a plurality of species of comma-shaped bacilli, and that these do not behave uniformly in either water, soil or any other media. We may not be dealing with distinct species, but with races or modifications due to change of environment. As Dr. Adami has very recently stated, there must be some little latitude in our conception of species among the bacteria: we must be prepared to discover considerable variations in the properties of any one species. By a due appreciation of this dictum, it is probable that many experimental inconsistencies may be explained. The existence of more than one variety of comma in different cholera dejecta is probably dependent upon the very varying conditions of the individual patient's intestinal tract—analogueous to the variation in symptoms and mortality of cases, as well as to variations in value of certain remedies in the disease. It is well known that in the present epidemic cases occur, which both in respect of symptoms and mortality must be regarded as choleraic, but in which the intestinal contents are devoid of cultivable commas, or indeed of commas at all. Such may be merely cases in which the commas have failed

to find intestinal conditions in which they could breed true: just as outside the body the same commas can, under the influence of artificial external conditions, assume important and more or less persistent morphological and physiological properties.

These considerations open up the whole controversy as to whether cholera commas in their life history undergo change in form and to whether they can assume a resting or spore stage, in which though overlooked and regarded as absent, their germs are all the while merely waiting suitable external conditions to renew their well known shape and effects. The more the life history of the comma bacillus is studied the clearer it becomes that this microbe is not one of the ordinary schizophyta, or if it be, then it is merely an evolutionary stage of some higher organism, or what is not unlikely, a true parasite, existing in man and animals in one form and needing another hoste, possibly the soil itself, wherein to complete its life history.*

Experiments with various samples of soil show that choleraic commas do rapidly and completely disappear and die out from soil when such is kept for a period of about three weeks, either dry or absolutely saturated with moisture, or however dry or moist when exposed to a temperature below 50° F., or when mixed in soil with putrefactive matter or with a large excess of fecal matter.

This incapacity on their part for continued life under such circumstances is apparently due to a want of oxygen, to excess of cold or heat, and to the presence of fungi and saprophytic forms of life hostile to them.

On the other hand, in moist states of the soil short of saturation, and in media, offering conditions short of those just enumerated, their inability to discover commas, as commas after a lapse of time, is no proof of the destruction and disappearance of the cholera germs, as these seem to be capable of undergoing morphological changes and of assuming a resting or spore stage, in which their duration of life seem to be indefinite, and from which on being transferred to more congenial soil—*e.g.* the alimentary canal of man and animals—they can assume active properties and powers.

In the *endemic area* the soil is probably the main if not the essential site of the processes and changes resulting in the production of the poison, which in man induces cholera. The soil concerned in these changes is, in all likelihood, that layer lying above the water level or the first impermeable stratum in

*I beg to refer to a most interesting article on this subject by G. F. Dowdeswell, M.A., F.L.S., &c.—*Lancet*, July 28, 1890.

a locality and once seeded with the specific organisms, the development in the soil or diffusion from the soil depends on certain conditions of that layer.

These conditions are, permeability to air, a certain degree of moisture which must not be excessive, a mean annual temperature of 72° F., a moderate amount of contained organic matter and an absence of decomposing and putrefactive processes. Any locality presenting these conditions throughout the year may be said to be capable of affording an endemic habitat for the cholera organism.

It is quite possible, as Naegeli has pointed out, that excessive dirt in a locality may be an efficient cause for the prevention of certain forms of disease in it, the excess of saprophytic organisms tending to the suppression of more or less parasitic ones, but no one could regard it as therefore desirable to increase the accumulation of dirt.

Lower Bengal, as typified by Calcutta, fulfils the above conditions. Assuming that prevalence of the disease in that area is a fair test of production of the cause, we ought to find, if these conclusions are correct, that the amount of specific material developed increases with the mass of generating stratum: this is exactly what we do find, as the maximum and minimum of cholera prevalence in Calcutta coincides with the maximum and minimum of the water level—or, in other words, with the maximum and minimum of non-water-logged soil.

If we go a step farther and equally assume prevalence in the same area to be an index of diffusion, there are two main channels by which a material developed or harboured in the soil may reach human beings in any locality: these are the water and the air occupying the soil interspaces. The phenomena of seasonal fluctuation in prevalence appears to fail, as far as the endemic area is concerned, to explain or support the idea of the water supply being the main channel of diffusion. Were it so, the maximum prevalence ought to occur at that period when the meteorological conditions are calculated to facilitate the entrance into the drinking water of materials derived from the bodies of those suffering from the disease. June, July, August and September are the periods when most material is washed into the tanks and drinking-water supplies in Calcutta, yet these are the months of minimum prevalence.

So too in May the rainfall is heavier than in April, yet instead of an increased there is a decreased prevalence, while in November more cases of the disease occur than in October, although the latter month presents greater chances of inwash of material by rain into the tanks and wells than the former.

If, however, we regard the air as the channel of diffusion by

which the cholera poison passes from the soil to the subjects of the disease, we find that the facts are different.

Exactly in accordance with that hypothesis, maximum soil ventilation occurs during March and April coincidentally with the maximum of prevalence: and the minimum of soil ventilation occurs during the rainy season, which is the period of minimum prevalence.

Strong as is the evidence in favour of the diffusion in the endemic region, from the soil of the specific cause of cholera by means of soil air emanations and dust yet it does not cover all cases as shown by the lessened incidence of the disease on all places provided with a pure and good water supply. Calcutta is a case in point, the disease has certainly lessened there, but has not disappeared. The existence of a pure water supply has reduced the number of cases by reducing the facilities for the propagation of the disease by virtue of a wholesome drinking water being substituted for one polluted by the recent dejecta of the cholera-stricken. This experience without appreciably weakening the soil theory of the disease merely strengthens the belief that possibly both channels are at work, and that too great reliance must not be put on either the one or the other.

These remarks apply altogether to the endemic home of cholera. It must, however, be noted that it has been the custom for most writers when speaking of the facts concerning the occurrence of cholera outside the well known endemic area of Lower Bengal, to maintain that the nearer the soil of any district approaches in character and conditions to that constituting the lower part of the Gangetic plains, the greater will be the risks and likelihood that cholera will be found to prevail there.

It is very much to be doubted whether this is a sound statement, but rather that the tendency of the disease to prevail on all alluvial soils, especially near rivers, such as in the valleys of the Brahmaputra, the Nerbudda, the Tapti, the Indus, and Euphrates, is due to the fact that those districts are endemic homes of the disease equally with the Gangetic valley. I am inclined to believe that cholera is after all endemic in several parts of India, which at present are not so considered.

It is, however, certain that personal intercourse between infected and non-infected places in India, while undoubtedly accounting for a very large number of cases, is insufficient to explain or account for some of the remainder, which in the main can only be explained by regarding the disease as truly endemic in, hitherto, unsuspected spots, and only requiring the establishment of certain indicated conditions in their superficial soil to determine the production of cholera, the chief of these being a

drying zone of soil, always containing the specific material causative of the disease.

The soil appears to play a direct part in the production and diffusion of cholera, *only in the endemic areas*; outside the endemic area the soil strata appears to have nothing whatever to do with the disease, its appearance there is due to importation of the virus and its diffusion as an epidemic to sanitary defects. Soil and climate alone have not been observed to originate the disease in non-endemic areas.

.. *On Tuberculosis; or, does Consumption arise from Flesh-Eating?* by JOSIAH OLDFIELD, M.A., B.C.L.

DISEASES are produced in a great number of ways, but the chief methods of propagation are:—

Firstly, by the INHALATION of disease germs into the lungs with the air breathed, and thence by the blood stream throughout the body;

Secondly, by the INGESTION of disease germs, together with the food eaten into the stomach and intestines, and thence by osmosis or by the absorption by the lacteals and lymphatics, or through some abrasion of the mucous membrane by a species of inoculation, into the lymphatics or the blood stream, and thence over the whole body.

Of these two causes of disease, I believe ingestion to be far the more serious, for a number of reasons, of which the simplest perhaps is the fact that a person may go with practical impunity into the presence of contagious disease if he is careful to avoid swallowing his spittle, and does not eat or drink anything while exposed to the infected atmosphere.

There are two serious modes, therefore, of disease propagation, viz. (1), inhalation; (2), ingestion; and of these two the latter is far the more serious.

The discovery of a cause renders the search for a remedy much more simple, and so if disease comes in through inhalation and ingestion, its entrance can be prevented by ceasing to inhale and ceasing to ingest.

To stop breathing and eating altogether is a remedy perfectly simple in theory, impossible however in practice.

The next remedy that suggests itself, therefore, is the breathing *only* pure air and eating *only* pure food. When we consider them, however, we find that both these conditions are impossible. All those whose occupation takes them into the presence of sickness are often breathing impure air.

As we are often obliged to inhale unavoidably impure air, so too we cannot always ensure that our food is free from impurity; but we can aim at avoiding food which is manifestly diseased, and if we cannot altogether escape risk, we can at any rate avoid touching those forms of food which are specially liable to disease.

I purpose showing, with regard to the special disease under consideration—Tuberculosis—that flesh food is a food which, as a fact, is diseased to an enormous extent, and not being a necessary food, all arguments point to the avoidance of it as an article of diet.

Amongst the terrible diseases which curse humanity, Tuberculosis is perhaps the most terrible; there are others which may be more painful or more rapid, but none which are more hopeless and more pathetic; and yet Tuberculosis in one of its varied forms is one of the most common diseases, so that in some way or another it affects, or has affected, every other person we meet.

It must not be supposed that because the seat of Tuberculosis is usually the lungs that therefore it is caused chiefly by inhalation, because the experiments of Dr. Burdon Sanderson show that even where the bacillus is introduced by inoculation, *i.e.*, by subcutaneous injection, it at once locates itself and manifests its energy in the lungs. And in a research by Professor McFadyean and Dr. Woodhead they found that in 127 cases of Tuberculosis in children, it was the mesenteric glands which were affected in 100 cases, and these would be almost certainly reached through the organs of alimentation. And we may conclude that in these cases the disease was introduced by the milk from tuberculous animals.

Now with regard to adults, attention should be carefully drawn to the correlated facts that

- (1) Tuberculosis exists in men to an enormously high percentage.
- (2) Tuberculosis may be communicated by ingestion of tuberculous food.
- (3) Animals used for food are, as a fact, infected with tubercle to an enormously high percentage.
- (4) It is practically impossible to detect the disease when the meat is cut up and offered for sale.
- (5) Tuberculosis in man may therefore be set down as arising

in a high percentage of cases from the ingestion of tuberculous meat.

(G) And finally, flesh is not a necessary part of the diet of man, and therefore in the face of the dangers with which its use as a food is connected, it is not less than suicidal to advocate an increase in its consumption, whereas the soundest policy is to agitate for its entire disuse under the existing circumstances.

THE BACILLUS TUBERCULOSIS.—

The *Bacillus Tuberculosis*, called so from its rod-shape (*Bacillus*=a little rod), is a micro-organism discovered by Koch in 1887, about 1-8,000th to 1-10,000th of an inch in length, and about 1-50,000th of an inch in breadth, *i.e.*, it would take some hundreds put end to end to reach across the eye of a needle. This micro-organism is of such vitality that it can stand a temperature of 107° for several weeks, and even one of 212° for some little time (say less than sixty minutes), before it is destroyed, while as to the spores it is at present impossible to say what amount of heat they can stand, so difficult is it to ensure their destruction; certainly the ordinary mode of cooking (which very often is not enough to coagulate the blood in the centre of the joint) is insufficient to destroy either the bacilli or their spores. Whenever a piece of flesh-meat is cut at the table and the inside is red and blood oozes out, there is one point quite certain, and that is that if there were any bacilli present they have not been destroyed.

These bacilli when they enter the body by any source, seem to get into the blood stream, or the lymphatics, and thence are carried to the lungs where they apparently usually settle down, and for some time appear to be lost, but their action and growth though exceptionally slow is sure, and is akin to the action of the *bacillus leproi* (leprosy) and ere long we find tubercles appearing; it does not always follow that because we only find tubercles in the lungs that the disease may be called "local," because when a more careful examination is made they are sometimes discovered in the marrow before any great manifestation of them takes place in the lungs, and it must not be forgotten that there may be thousands of spores present, and yet they may not be able to be discovered in the field of the microscope, so very minute are they in comparison to the corpuscles of the blood, or the tissues in which they may be located.

The bacillus propagates by fission and also by spores, and therefore, once it has managed to secure a permanent lodgment free from the attacks of the protective corpuscles of the blood, it keeps sending out host upon host to extend its conquest, and so the usual mode of progress is for a greyish deposit to be made

in the normal tissue, and then this caseates (becomes cheesy), and sometimes cretifies (becomes chalky), and sometimes passes into the condition of pus, in which the bacillus is specially active and rampant. It is also, meanwhile, throwing off a very poisonous alkaloid, which tends to reduce in an alarming degree the vital resistance of the body. This virulent poison contains the celebrated Tuberculin, and the power of this is well known; one millegramme of Koch's fluid, which contains 1 per cent. of the essential principle—that is to say, only 1-6,500th part of a grain of the tuberculin itself—is enough to produce high fever and considerable swelling, and it is, therefore, one of the most powerful poisons known. According as these bacilli or spores manage to find lodgment in the various organs of the body, so is a different name given to the disease—when they commence operations in the mesenteric gland, the disease goes by the name of "Tubes Mesenterica." When the brain is attacked we have Tubercular Meningitis, or water on the brain. When the lungs are the organs affected, and this is the most usual in the case of adults, it goes by the name of Phthisis or Consumption. When the joints or the glands become the seat of the mischief we find what is called a Scrofulous or Strumous state at once resulting. When it is the skin we have Lupus caused, while many cerebral and paralytic diseases apparently have their origin in the same terrible bacillus, so far extending and so potent is it in its power to injure.

Dr. Landouzy, member of the Academy of Medicine, and one of the Editors of the *Revue de Médecine*, says:—

"I shall never be weary of repeating at this moment of discussion on the depopulation of France, that tuberculosis of itself does more for the depopulation of our country than alcoholism, syphilis, and Malthusianism put together."

TUBERCULOSIS MAY BE COMMUNICATED BY INGESTION OF TUBERCULOUS FOOD.

It has already been shown that ingestion in general is a more serious form of disease contamination than inhalation, and that this holds good, as well for tuberculosis as for other infectious diseases.

It is quite true that the injection of the bacilli may take place in other ways than by eating of diseased flesh, and that they are so introduced into the system, is proved by the presence of consumption in a high percentage among people whom we may suppose are not exceptionally large flesh-eaters, *e.g.*, people exposed to an atmosphere laden with dust.

While the fact of tuberculosis, however, arising in other ways

is true, it is none the less certain that the ingestion of tuberculous flesh is a very serious factor in its dissemination.

Whatever may be urged about the power of the juices of the stomach to destroy disease germs, applies happily to all the cells of the body in a greater or less degree, and therefore if they were absolutely invincible, no disease of any organ could result by any means, for the cell attacked would annihilate the attacking disease germ, but it is because no organ of the body is able to withstand too often reiterated attacks upon it that the stomach also, though it doubtless destroys many noxious living things that enter it, yet under certain conditions allows enemies of the body to pass its portal, and we have the demonstrations of Strauss and Wurtz distinctly to prove the inability of the gastric juice and the fluids of the alimentary canal to destroy the *Bacillus Tuberculosis*; the same thing is also conclusively shown by the fact that in the later stages of tuberculosis of the lungs, when there is not strength to expectorate all the phlegm, and so in consequence part of it gets swallowed, tuberculosis of the intestines often follows.

The only other possible objection to the position that tuberculosis is disseminated by eating diseased flesh, is that cooking destroys the bacilli.

This undoubtedly is true: there is no animal or vegetable life known which cannot be destroyed by raising its temperature sufficiently high. But what meat is so cooked that all its substance is raised high enough to destroy the bacilli of tuberculosis? We have seen what they can stand (but how much more their spores can stand we do not know), and there is no living flesh-eater but will acknowledge that flesh-meat is constantly eaten which is still red, in which even the blood is not coagulated, and that the greatest proportion of the flesh eaten has not been exposed to the same heat in the interior of the joint as it has on its exterior.

ANIMALS USED FOR FOOD ARE, AS A FACT, INFECTED WITH TUBERCULOSIS TO A VERY HIGH PERCENTAGE.

The issue has now been reduced to this point, that flesh-eating is a serious cause of consumption if the flesh of cattle be tuberculous to any appreciable extent.

There are two points here which have to be faced: (1) Are the internal organs often diseased? (2) Even though those organs be so diseased, is the flesh thereby affected, or is it sufficient to remove the diseased organs and use the rest of the carcase for food?

In the great Glasgow case, which was tried before Sheriff Berry in May and June, 1889, extracts from the evidence of

Professor Walley ran as follows: Commencing question 2476.

"And if an animal was not fit for human food you would not allow it?"

"You will understand that I am the Inspector for the Privy Council, but I have nothing to do with any disease unless it is under the Contagious Diseases (Animals) Act, which tuberculosis is not."

"And you tell us that the cow was so bad that, apart from all disease, you would have condemned the carcase?"—"Yes."

"You allowed the animal to pass in such a state?"

"I allowed it to pass because it had no pleuro-pneumonia. I had no power to interfere."

In Dr. Inlach's examination an extract was read from a published article of his, which was as follows:

"Cattle kept solely for dairy purposes, and particularly in large towns, suffer by far the most severely from this affection (tubercular phthisis). Constantly confined in stables which are not always well ventilated and clean, deprived of exercise, drained of milk in large quantities, and fed on the kind of aliment which most favours the increase of that fluid, though it may not enhance its quality, it cannot be wondered that the nutritive functions of the cattle so treated must suffer to a serious extent. Indeed, it is a matter of daily observation that the cows which are abundant milkers are most liable to this disease."

Q. 4734.—"You are the medical officer of health for the town of Hull?"—"Yes."

"What do you do in cases of tuberculosis?"

"We pass animals affected with localised tubercle of the lung in the first stage."

"Suppose the tubercle affects more than the lung?"

"We pass the carcase as fit for food."

Q. 5064.—"Is tuberculosis a common disease in milk stocks in and about Glasgow?"—"It is."

By the kind invitation of Professor Wynter Blyth, I accompanied him and some representatives of the College of State Medicine to inspect the slaughter-houses at Deptford.

As it is well known this is the great point for the import of foreign cattle. Every facility is here provided; there is no slaughtering in the early dawn or in the gathering gloom of evening to escape the eye of a possible inspector. Everything is done at fixed hours, and every beast is kept several days after landing, and has to pass under the inspector's eye before being allowed to be slaughtered. Everything is simple and straightforward, and collected within a narrow focus, which makes it perfectly easy to be thoroughly supervised—so different from

the scores of private slaughter-houses scattered hither and thither in the ordinary inspector's wide district. All the meat goes up from Deptford, too, to the Central Meat Market, and is there again inspected. What more would you have? Is not this a sufficient guarantee that meat killed at Deptford is at any rate free from the possible taint of Tuberculosis?

Not at all. Let me explain why.

The following few questions and answers show where the screw is loose, and tell the same old tale of non-immunity from tuberculous meat.

"Everything landed here is inspected, of course?"

"Oh, yes, not an animal passes but what has been inspected."

"What are they inspected for?"

"For? 'Foot and Mouth' and Pleuro. They've been very strict till just lately again, owing to the outbreak of the 'Foot and Mouth.'"

"For anything else?"

"No, nothing else, unless there were any infectious fever."

"Not Tuberculosis or Actinomycesis, I suppose?"

"Oh, no, the inspector has nothing to do with that."

Thus so far the tuberculous animal passes on unchallenged.

"When they are slaughtered is there an inspector present?"

"Oh, no, we are slaughtering all day, the inspector has nothing to do with that."

"He doesn't see the slaughtered carcases, then?"

"Oh, no, that's all done at the Central Meat Market."

Now carefully note the next replies in the light of the fact that once the internal organs are removed, and the carcase stripped and dressed, it is almost impossible to detect Tuberculosis, even in cases of an advanced and terribly dangerous character.

"What is done when the animal is killed?"

"It lies a little time on the floor to bleed; is then skinned, the intestines and all the internal organs taken out, dressed and carried to the refrigerating chamber, where it remains inside about twenty-four hours to harden, and is then sent up to the market."

"And what becomes of the internal organs?"

"Oh, they are contracted for and are carried away."

"Are they not inspected?"

"Oh, dear no, we have nothing more to do with them."

And this is the state of affairs in the model slaughter-house of Great Britain!

And people will hug themselves under the delusive belief that their meat has been inspected, and that "good" butchers never get diseased meat.

There is abundant evidence to show that to-day our breeders breed tuberculous animals, our feeders rapidly fatten-up animals which have become tuberculous from long lactation or other causes, that our butchers purchase (sometimes honestly and ignorantly, and sometimes knowingly and purposely) these animals privately or in the open market, and they are slaughtered in private sheds and slaughter-houses, in villages and towns alike, under no supervision, that the carcases are "stripped," and the internal organs, if *badly* diseased, are otherwise disposed of, and if not *very* badly gone are sold in cheap shops or give substance to highly spiced sausages, while the remaining portions of the animal in which the disease is unable to be detected except by a microscopical examination—which it never gets—are distributed far and wide, and appear equally as sirloins on the royal board or as tripe in the peasant's hut.

The great struggle as to the danger of tuberculous meat has been fought over the question of "general" or "local" Tuberculosis. On one side it has been urged that when the disease is restricted to a small area of lung surface the rest of the carcase is in no way affected, and if the affected organs be stripped away the flesh of the animal may—and for economical reasons should—be used as food and not destroyed; while the other school has consistently maintained that the presence of a tuberculous deposit, however small, proves the presence of the specific bacillus, and that to enable this lodgment in the lung to have taken place, the blood stream or the lymphatics must have been passed through, and therefore probably contain others travelling on the same road; and, moreover, the fact of tuberculous deposit means an active presence of bacilli, constantly multiplying by fission and spore at an enormous rate, and sending out these offsprings by hosts into the blood stream, and thence over the whole body, so that the presence of a trace of tuberculous deposit renders the risk of partaking of any part of the animal so great, that the whole carcase should be at once condemned.

There is a *via media* which seems to me to contain the truth, and it rests on the fact of the wonderful power of the organism to protect itself, when it is unable to destroy or eject an invading foe, by encysting it or walling it up, so that eventually it is enclosed in a prison and is quite cut off from the busy life which is going on all round it. A good illustration of this is shown in the case of tuberculous warts which butchers sometimes get on their hands from *handling* the tuberculous meat. (This is the same meat which other people *eat* and so get tuberculous lungs.)

It often happens that in such cases the wart remains quite

local, and becomes so encysted from the blood stream that this is the only point where the disease exists. But these are comparatively rare cases.

At the earliest stage of lung tuberculosis it is impossible to say that the disease is "local," because whenever tubercles appear in the pleura, they must have come there through the blood stream, and therefore, the blood stream is diseased, and with a diseased blood stream the whole body may be, or may at any moment become, diseased.

I want to point out, therefore, two results of this, the first is that the term "local," as meaning harmless as to the rest of the carcase is misleading, because it is impossible to say at any moment that the bacilli are restricted to the tubercle which they have caused; the second is that by "stripping," only such organs as the pleura are removed, while the blood vessels which pass through the whole of the body remain and the lymphatics into which the bacilli apparently very early pass, cannot be removed, as they are for the most part surrounded by fat and stowed away all over the body.

The position I have taken up is the one to which the latest studies in bacteriology seem to tend, and it is a significant sign of the recognition of this, that at the proceedings of the North-Western Branch of the Society of Medical Officers of Health held at Manchester, on May 20, 1892, after a discussion on a Paper by Dr. J. Anderson, entitled, "Tuberculous Meat and its exclusion from the Meat Market," the following resolution was unanimously agreed to:—"That the flesh of any animal affected with Tuberculosis, to however slight an extent, is, in the opinion of this Branch, unfit to be sold for the food of man."

The conclusion, therefore, seems to me to be beyond dispute, that under existing circumstances, the eating of flesh food in any form is inimical to the health of the community as being a great factor in the origination and spread of consumption.

The PRESIDENT of the Section (Prof. Lane Natter) said the Institute was not responsible for the views expressed in the Papers. They simply expressed the views of the writers. The advantage of such papers was that they afforded a groundwork for discussion, and each one had something to learn. Their value could not be over-estimated.

SIR CHARLES CAMERON (Dublin) said they had listened with very much interest to an undoubted lecture on Vegetarianism in disguise.

It would have been just as well to discuss in this paper all the diseases that were derived from the animal kingdom by the consumption of the flesh of animals. He gathered from the paper that they were likely to be emancipated altogether from this enemy of the human race, tuberculosis, if they abstained from eating animal flesh, but still it was a curious fact that the very animals which appeared to abstain from eating the flesh of other animals were not exempt from tuberculosis. It was curious that cows, which were strictly vegetarian animals, should suffer so terribly from this disease. If they carried the author's doctrine to its logical conclusion, they might just as well say that because cholera and other diseases were obtained from drinking water they should give up water drinking and take to whiskey or porter and such like things. What would become of the grass? The only known individual who partook of that commodity was the celebrated eastern monarch, he (Sir Charles) was not aware of any other person having been turned out to graze in pasture. But joking apart, for it was no joking matter, there was a great deal of truth in what the essayist had said with regard to the flesh of animals, but he thought Mr. Oldfield had somewhat exaggerated the amount of tuberculosis derived from that particular source. He knew of many places where this disease is rife, although the people were enforced vegetarians. There were many districts in Ireland where tuberculosis was the most fatal of all diseases, and yet the only animal food the people took was bacon, an extremely long time in pickle, and which had been very well cooked. On the other hand there were well-to-do people who ate plenty of meat, and yet they did not get tuberculosis to a greater extent than poor people who ate very little flesh. He hoped the essayist would not think that he differed from him altogether, because there were many things in which he agreed with him, although he could not go with him in his argument for abstaining from meat altogether. He quite agreed that where an animal's flesh was affected with tuberculosis it was the duty of the officer of health to say that it should be confiscated. That was the custom in Dublin. If the flesh was in any way apparently affected they never by any possibility allowed it, or any part of it, to be used as human food. In the abattoir which the Corporation of Dublin had erected, and in which the carcasses of animals were minutely examined, and in which it was no one's interest to allow anything bad being passed, they had found that the percentage of cases of animals affected with tuberculosis was very small indeed. Therefore, for the remedy they must look for greater vigilance in the examination of private slaughter-houses, and the compulsory placing of all abattoirs in towns under the control of the local authorities. That was all they could reasonably do, for it was not reasonable to say that because one person in ten thousand was affected with tuberculosis through taking meat that all should abstain from flesh eating.

MR. WASHINGTON LYON (London) said the essayist's remarks about the slaughter houses at Deptford were quite true. There the animals

were landed, killed, and the meat sent to the Central Market, where it was inspected and if bad seized. He himself had seen meat condemned there. It was then thrown into a tank with a chemical solution that prevented its being used as human food. It was then taken away by a contractor and destroyed. As far as the City of London was concerned everything possible was done to prevent diseased meat getting into the market. He (Mr. Washington Lyon) agreed with the President that it would not do for all to become vegetarians. He did not think they need go away from this meeting frightened, but confident in what was being done by the Sanitary authorities in the United Kingdom, such as in Dublin, Manchester, Liverpool, and other large towns, who were taking this matter up for the public safety generally. But even if diseased meat got into the market he could not believe that there would be much harm done if eaten, after it had been cooked in 212 degrees of heat. Another point to consider was that if steam under pressure was used for cooking purposes they could get an amount of heat which could be obtained much beyond 212 degrees. He was, therefore, quite sure that this would be enough to destroy any dangerous germs in diseased meat.

Dr. ARMAND RUFFER (London), who said he spoke not as a Medical Officer of Health but as a pathologist, had made a large number of *post mortem* examinations of those who had died from phthisis, and he was sorry to state that he disagreed entirely with Mr. Oldfield. Before he could be justified in drawing these conclusions Mr. Oldfield should have explained how it was that in making *post mortem* examinations they so seldom found a case in which a patient had died from phthisis as the result of having taken tuberculous food. He did not remember having come across more than five cases of adults in which he could have said "this person may have died through tuberculosis contracted in taking tuberculous food." In the case of children it was different. When a man was inoculated with tuberculosis, the first thing to be seen was a primary or local reaction, and from the glands the disease spreads over the whole body, although it might skip an organ here or there. If it began at the apex of the lungs, it spread downwards, and then gradually all over the body. In all examinations of cases of phthisis they always found, if it was a case of long standing, that the patient had phthisis of the lungs a long time before he had it in other parts. With children it was different, and in them it was the drinking of milk that was the great danger, as it was in its milk that the real danger of the tuberculous animal lay. The bacillus tuberculosis was a micro-organism, which could be killed by a very moderate degree of heat, and if people would only cook their meat properly and not eat it half raw, there would be practically no danger from eating tuberculous meat. He believed that one bovine animal out of seven was affected more or less from tuberculosis, and it seemed to him that they should not condemn those animals simply because there were bacilli in the internal organs which were not eaten as no tubercle-bacilli had ever been found in the meat. He thought the danger of

ingestion of disease-germs by eating meat had been largely exaggerated, the great danger of tuberculosis being spread by animals lay in the milk, and not in eating their flesh. In his opinion, too, for every person who died from ingestion of meat, hundreds died from being inoculated by contact with human phthisical patients. If they went into a hospital they found that the patients who had died from phthisis had lived or had been in immediate contact with persons who were themselves suffering from phthisis. Phthisis had been proved to be catching, and every death from phthisis might be avoided, for every case was a case of infection. People should be taught that phthisical patients were a source of danger. Medical men should impress this on their patients, and not allow them to be a centre of infection for their fellow-men.

Sir THOMAS CRAWFORD, K.C.B. (London) quite agreed with all the last speaker had said. One thing had not yet been touched on, and that was the result of their experience in sanitary work. During the last fifty years it had been impressed on them that if the people of this country would be free from phthisis they must live in pure air. Formerly their soldiers were crowded in barracks, and this disease was a common ailment. Dr. Parkes and other medical men had impressed upon the authorities the necessity of giving the men abundance of fresh air in their dormitories, and when that was done they had the pleasure to report a steady and continued decrease in phthisis. He hoped they would keep those views in the forefront, and proclaim that where there were large bodies of men crowded in one common ill-ventilated lodging, they had a potent factor of consumption—foul air.

Miss YATES (London) wished to point out that vegetarianism claimed that abstinence from eating flesh was only a negative portion of the cure for consumption. The diet they recommended was a preventive against its being acquired. They claimed that the foods they advocated would enable persons to retain their bodies in such a healthy state that they would be able to resist the attacks of the bacilli. Grains and fruits contained a large proportion of the phosphates that all physicians agreed are of utmost importance in the consumptive diathesis. People of consumptive tendency were unable to digest oily or fatty substances, and vegetarians claimed that the diastatic principles contained in grain were a great aid in enabling people to digest, and assimilate fat, which they could not do under ordinary conditions. Therefore, on those grounds alone, they claimed that their diet would enable a person to repel attacks of this disease. It was stated that if diseased meat was cooked at a great heat it could be taken, but meat in that condition would be repugnant to a refined taste even if it were harmless, and why should people eat it when better food could be procured without any taint of disease. It was asked, therefore, that vegetarian food should be adopted, as it would enable consumption to be resisted as well as numerous other diseases to which so many were subject.

Dr. J. C. THRESH (Chelmsford) said that the same subject was discussed at the Conference of Medical Officers of Health on the previous day, and a resolution was then passed expressing the opinion of the meeting that where tuberculosis of a single organ of the body is associated with impairment of the nutrition of the flesh the whole animal should be condemned. On the other hand at a similar conference recently held in the north of England a resolution was adopted recommending the destruction of the whole carcase if only one organ were affected, whatever the condition of the flesh. For one conference to suggest one thing, and another a different one, naturally had a prejudicial effect upon the mind of the public. He thought, to condemn the whole animal for the slightest trace of tuberculosis was an extreme measure.

Dr. J. F. J. SYKES (London) insisted that the assertion that the mere abstinence from meat would prevent tuberculosis was fallacious, and the section must not allow it to go forth. It was a question of air as well as food. Sir Thomas Crawford had testified to the effects of air-borne contagion, and he (Dr. Sykes) was most anxious that no half-statement should lead to a wrong conclusion. With reference to Dr. Thresh's remarks as to the opinion expressed by the medical officers of health at their conference, he thought the section should not go so far as to condemn all food which was in the slightest degree affected with tuberculosis. He was of opinion though that there were many ways in which meat condemned as human food could be used. In Berlin, for some time past, tubercular food condemned in the public abattoirs was placed in a Rohrbeck disinfectant. This was a steam disinfectant chamber in which the meat was placed after being cut up. Steam was driven through it, and maintained in the chamber under intermittent pressure. By this method it was made useful cooked food for animals, and it could be safely used for that purpose. This, he thought, was one of the most practical methods of utilising condemned meat.

Mr. J. OLDFIELD (London), in reply to Dr. Sykes, said he did not state that for a man to abstain from flesh eating would be a cure for consumption. This paper was entitled "Flesh eating a cause, not the cause, of consumption." It was one cause, and he maintained it was a very serious cause, but he would be sorry to say that it was the only cause. He didn't deny that there were other causes, such as tuberculous milk and limited supply of air, but he maintained that meat was one cause and he wanted to keep to that one cause, and to bring before the Conference that meat was a very serious cause of consumption. As to Sir Charles Cameron's joke about the great man of Biblical fame who was turned out to grass, it was worth while remembering that he got cured of his madness by his change of diet. Now he (Mr. Oldfield) did not mean to infer that people would be cured of madness by being turned out to grass, but he did say that consumption would be diminished by eating grain and such kind of food. He wished it to be remembered too that after the internal

organs had been removed it was impossible to tell whether meat was or was not tuberculous. At Deptford the internal organs were removed and the meat was then sent to the London market, if then found to be diseased it was destroyed. Professor Ruffer had asked how far it was possible in making *post mortem* examinations to find cases of tuberculosis due to eating tuberculous food? He could not answer that, but he said that in that room every fourth person would die of tuberculosis affection, so that it was too serious a matter to be trifled with. That was the first point in his paper. His second was that all animals were infected to a large extent with tuberculosis, and his third point was that consumption could be communicated by ingestion of tuberculous food. Then with regard to milk. He did not raise that question. What he said was as to meat, and milk was therefore, outside of his argument. As to the point can the bacillus be killed by cooking? He said it could, and his paper said it could, but what he contended was that it was *not* killed by the ordinary cooking. If meat were cooked so much as to ensure the bacillus being killed, it would be tasteless, and people would not care for it. It would destroy the flavour. They did not find herbivorous animals suffering from tuberculosis in their natural state. It was not until they had been stall fed, and subject to continuous lactation that they became liable to the disease. They hardly ever found wild herbivorous animals, on the plains of America for instance, suffering from tuberculosis. Professor Ruffer had pointed out that living with those suffering from consumption was a cause of the disease, but this only emphasises the point claimed; for it was the sputa, becoming dry, getting into the air and so settling on the food swallowed that caused the spread of the disease. Therefore, living in houses with consumptive people, where there was a possibility of food becoming infected by the sputa, bore out his contention—that it was chiefly ingestion which caused the disease.

The PRESIDENT of the Section said they were much indebted to the writer of the paper for bringing the subject forward, as it had elicited many eminent opinions on the matter. No doubt any resolution the section thought judicious would be passed by the Council. If they recommended for adoption a resolution for the total abolition of all private slaughter houses, this would be going to the bottom of the whole question. All slaughter houses should be placed under the supervision and control of the sanitary authority, and private slaughter houses, except in remote districts, abolished.

Mr. J. OLDFIELD (London) said he would propose "That this section is of opinion that in towns with a population of over 20,000 inhabitants, private slaughter houses should be totally abolished, and be superseded by public abattoirs under the control of local authorities."

Dr. H. W. A. SANDELL (Leighton Buzzard) seconded, and the resolution was carried unanimously.

"For how long does Vaccination confer immunity against Small-pox," by Veterinary-Capt. F. SMITH, M.R.C.V.S., F.I.C., Professor in the Army Veterinary School, Aldershot.

In bringing to the notice of the members of the medical profession certain practical points in connection with vaccination, I have had to assume what I believe to be a fact:—

1. Efficient vaccination is protective against small-pox.
2. Susceptibility to the virus of vaccina, is indicative of the person being susceptible of contracting small-pox.

The few remarks I have to make are based entirely on this second proposition; if it be untrue or unproven then my figures and deductions are valueless, if it be accepted as proved, or in all probability true, then an examination of my figures reveals a state of affairs of considerable practical importance, and of very great interest.

As I am not a member of the medical profession, it is perhaps incumbent on me to explain the source of my information, it is derived solely from the Returns rendered to the Army Vaccine Institute, of which I have charge, by the medical officers in charge of the troops. The Institute was established to furnish a supply of calf lymph to the army, and this material is the source of nearly all the vaccinations performed at home and abroad, excepting India which supplies its own. The figures I have to quote are solely selected from the returns furnished by the United Kingdom.

It may be urged that some of the results recorded are due to the use of calf lymph, and Professor Michael Foster has drawn my attention to the necessity for clearly distinguishing between humanized and calf lymph in the length of protection afforded. Unfortunately, I have no facilities for comparing the difference, if any, in the relative protection given by these two lymphs, as humanized lymph is not issued by the Institute.

The total number of vaccinations of which I have to speak is 85,423 divided into two groups, primary and re-vaccinations:

	Primary Vaccinations.			Re-vaccinations.			Total.
	Perfect.	Modified.	Failed.	Perfect.	Modified.	Failed.	
United Kingdom ...	5,271	132	429	54,497	15,842	9,252	85,423

Percentage of successful primary vaccinations, 92·64 per cent.
Percentage of successful re-vaccinations, 88·37 per cent.

On turning to the re-vaccinations performed, to the number of 79,591, it is surprising to notice that no less than 88·37 per cent. of these men, varying, say, between 18 and 20 years of age, were found susceptible, 54,497 being returned as perfect vesicles.

I have seen many hundreds of these arms; the vesicles are as perfectly defined as in a primary vaccination. It is important to bear this fact in mind, for no matter what view we take of the modified vesicle, I think there can be no doubt that a person who develops a perfect vesicle is one who would have contracted small-pox if exposed to the contagion.

On examining the 5832 primary vaccinations it is found that 92·64 per cent. were successful; these vaccinations were only four and one quarter per cent. better than the re-vaccinations.

In what way are we to interpret these results? It is certain that of 79,591 persons only 11·63 per cent. (adopting vaccination as a test) were protected against small-pox, and this number may be further reduced when we consider that many of the failures were due to other causes than protection, for of the primary vaccinations 7·36 per cent. failed. If, therefore, we take these figures as representing the failures due to inert lymph, &c., it leaves only 4·27 per cent. of the adults as protected against small-pox by their previous vaccinations.

Cory* has shown that every person after vaccination has a tendency to return to his original unprotected condition; the further he travels back the more perfect does the vesicle become if re-vaccination be practised; the shorter distance he travels back the more imperfect is the vesicle and the more rapid its progress, for instead of having to run an eight days' course it may only have to take a three or four days' journey; the character of the eruption will, therefore, determine whether the persons required re-vaccinating badly or not.

This is doubtless true, but we are still left in ignorance of the probable length of protection afforded by efficient vaccination viz., is it a protection for a term of years, months, or weeks?

My figures show that 68·47 per cent. of persons between the ages of 18 and 20 years, have travelled back to their condition of absolute unprotection, and 19·9 per cent. have travelled back to some unknown point in Cory's scale. The first group, if exposed to infection, would have suffered from unmitigated small-pox, the latter from modified small-pox.

* "Some Aspects of the Vaccination Question." R. CORY, M.A., M.D. St. Thomas' Hospital Report, vol. xv.

Further, are we to believe that an efficient re-vaccination at some period of our lives will give a long immunity, or an immunity which can only be measured by months? On this question I considered I had come across some new facts, but Dr. Cory in a recent letter to me, where he has obligingly stated his views on this subject, has expressed himself that he has often seen a re-vaccination take within four months after re-vaccination, the character of the eruption being, however, very modified, owing to the fact that the person had a shorter distance to travel to the safe point. Such is my experience, though I have never tried re-vaccinating within such a short time as four months after a previous re-vaccination, but I am quite clear on the point that within three years of a thorough re-vaccination it is possible for a person to be successfully re-vaccinated, the eruption produced being naturally of a modified character.

I can, however, go a step further than this, and affirm that after a successful primary vaccination, it is possible to successfully re-vaccinate a person twelve months later, the only difference between the first and second vaccinations being that the latter will run a more rapid course, though, excepting for this fact, the character of the vesicle produced is nearly indistinguishable from a primary inoculation.

The number of insertions required to give immunity is a matter of extreme importance; I have observed in re-vaccination, that an insertion made every two days will always take until five have been made. After that, immunity is obtained.

I have not had an opportunity of making this observation in a primary vaccination, but Cory mentions having vaccinated an infant every day for eleven days, and none of the insertions after the ninth day were successful.

In endeavouring to focus the facts contained in this communication I would draw attention to the following points:—

1. The large proportion of unprotected adults in the community, as judged by their susceptibility to vaccination.
2. The very brief protection afforded by vaccination and re-vaccination, as judged by the successful re-vaccinations.
3. The certainty with which re-vaccinations can be made within a short period of a previous re-vaccination.
4. The possibility of successfully re-vaccinating an infant twelve months after a primary vaccination, the vesicle running a shorter course, but being nearly indistinguishable on the fifth day from a primary vesicle on the eighth day.
5. The necessity for five insertions if efficient vaccination is to be practised.

I do not disguise from myself that we have no positive evidence that susceptibility to vaccination represents susceptibility to small-pox; in fact there is much which may be urged to the contrary, of which perhaps the German and British Armies afford the best example; still, I consider it is a question on which we should be perfectly clear, and no harm can be done to the vaccination question by strengthening it on points which appear to present a certain element of weakness.

Mr. WASHINGTON LYON (London) said that when the Congress met at Worcester he put a question to the Medical Officer of Health as to whether he had examined the Schools there; he said that he had examined one School, and found that 90 per cent. of the children were vaccinated. In London with its 5,000,000 population about 7 per cent. of the children were not vaccinated. That was a most dangerous element in our midst, because such a large percentage was so likely to be the cause of the spread of small-pox.

Dr. J. F. J. SYKES (London) said it was liable to be understood from the paper that only a brief protection was afforded by vaccination, and re-vaccination, but that was not the point. The writer did not say that people vaccinated or re-vaccinated were liable to get small-pox after a few months, but that in a few months they could again be re-vaccinated. The conclusion must not be drawn that only an immunity of a few months could be afforded against small-pox, as practical results proved that the contrary was the case. For instance, the Chemnitz statistics—which were comparatively new to English readers—distinctly showed that all children under five years had absolutely escaped small-pox in that town during an epidemic, owing to vaccination. He thought Veterinary-Captain Smith might amplify this point more, so that those who were anxious to read wrongly would not have the opportunity of doing so.

Sir THOMAS CRAWFORD, K.C.B. (London), said the experience of all England and Germany, as well as the Army and Navy, was in favour of the protection afforded by vaccination and re-vaccination. All children should be re-vaccinated when they were twelve years of age, as it was generally accepted that their re-vaccination was necessary, and it should be the object of all who desire to ward off this terrible disease to be re-vaccinated.

Dr. H. W. A. SANDELL (Leighton Buzzard) said he unfortunately lived in a district where vaccination had been suspended by the casting vote of the Chairman of the Board, the place having been previously whipped up by the constant agitation of a dissenting minister,

although the operation was well and carefully performed in the district. An anecdote here is worth relating; a certain anti-vaccination candidate seeking election as Guardian (?) at the time of canvassing tried to obtain a woman's influence against vaccination, and was met with the reply, "Get along with you, you can't say it does no good, for when I was a girl there was so many persons marked with small-pox, while now there are scarcely any," and as she laconically put it, "He did not trouble me further."

Mr. W. SCULLARD (Portsmouth) said there were ten in his family, and only two were attacked during an epidemic of small-pox, and it was of so mild a form that they kept about as usual, there were not more than three or four eruptions on each. He attributed this immunity to vaccination. He was pleased to see the subject brought forward, as in their town there were people defying the law and willing to go to prison rather than have their children vaccinated.

Dr. BOND said the effect of primary vaccination passed off in time. A short time ago he did duty in a hospital for small-pox in a small district. There were 100 cases in twenty-eight days. Although a strong feeling prevailed against vaccination, this was now entirely in abeyance. He got the inmates to have their families vaccinated or re-vaccinated, and he was able to persuade 450 to submit to the operation, and out of that number not a single case of small-pox occurred; but out of the 180 persons who declined there were eighty cases. It was not safe, however, to trust to primary vaccination. He had seen many cases among children who had been vaccinated, and who had had small-pox *before they reached five years*. To afford any protection, there must be re-vaccination.

Mr. WASHINGTON LYON (London) moved the following resolution:—"That this section is of opinion that the Vaccination Laws should be removed from the control of Boards of Guardians and transferred to the Sanitary Authorities, of whom the Medical Officer of Health was the Executive Officer."

Mr. W. SCULLARD (Portsmouth) seconded.

In reply, Vet.-Captain SMITH said he had hoped to learn whether insusceptibility was an indication of a person not being liable to take small-pox.

The PRESIDENT of the Section said they might accept it that re-vaccination was a necessity.

The resolution was carried unanimously.

On "Disposal of the Dead," by Rev. F. LAWRENCE, Hon. Sec. of Burial Reform Association.

EARTH-TO-EARTH burial is respectful, natural, in accordance with sanitary law, and consistent with economy.

I. It is respectful because no greater respect can be paid to the dead body than so to give it back to the earth as to admit of its performing its proper function in building up fresh life out of its own decay. That which above ground is offensive, under the earth is inoffensive; what is putrefaction above, becomes resolution and transformation below. Moreover, by this mode alone is it possible to preserve the sacred inviolability of the grave, for before the earth is used for another burial, the former tenant will have passed away, resolved and re-distributed.

II. It is natural, the earth being the natural recipient of everything that has lived and died upon its surface; whereas to enclose the corruptible body in a strong coffin, and to exclude from it the purifying influences of earth and air, dooms that body to seethe in its own corruption for any time to come, and to generate poisonous gases which no hermetical sealing can restrain, and which, generations hence, may find their way among the living as the avenging angels of violated nature.

III. "Earth-to-earth" burial has never been proved to be productive of evil results. The Medical Officer of the Prussian Diet in his report to the Government, Dr. Petrie before the Berlin Conference, and other eminent scientists have declared burial places, when conducted on sanitary principles, to be harmless. Mr. Seymour Haden in 1865, in his memorable letters to the *Times*, wrote: "A body properly buried, that is, in such a way that the earth may have access to it, does not remain in the earth, but returns to the atmosphere. The air with its rains filters through the earth above, and when it reaches the body, resolves it into new and harmless products." Dr. Poore, in his recent address, as President of the first Section of the Brighton Congress of The Sanitary Institute, entitled "The Living Earth," said that "the mould which forms the upper stratum of the ground on which we live to the depth of three to six feet, teems with life, and the micro-organisms which abound in this upper living mould oxidize or reduce to their atoms all

organic substances." On another occasion Dr. Poore declared properly conducted cemeteries not only harmless, but when near inhabited districts positively beneficial, as supplying the breathing places which are essential amidst great populations. Lord Playfair wrote, "If the coffin be of a perishable nature, if the soil be dry and porous, if the graves be not too crowded, the dead are resolved into air and into ashes as certainly in three years as they are in a furnace in the course of an hour, and in both cases without injury to the living." The fact is the earth-to-earth system is a quasi-cremation, effected naturally by the action of earth and air in a manner regardful of the Public Health. It is not this mode which is harmful, but the disrespectful, unnatural, irrational, falsely-so-called burial, in durable coffins and vaults.

IV. This mode is consistent with economy. This timely interment necessitated by the earth-to-earth mode of burial, that is, as soon as signs of decomposition appear, renders it difficult to procure special black attire. The simplicity of the actual burial will beget simplicity in all the accessories. The coffin will be the slightest and lightest possible, such as the coffin of compressed pulp invented by Mr. Larkman, of the Necropolis Company. There will be no massive monument on the grave, excluding air. Moreover, the cemetery being used as a quasi-crematory, that is, a place for the resolution and dispersion of the body, and not for its preservation, the entire area of the cemetery will be available for use generation by generation for all time to come, rendering a fresh cemetery unnecessary.

The enquiry at once arises,—with a mode of disposing of the dead which was respectful, natural, harmless to the living, and economical, what was it that rendered our churchyards centres of pestilence, and which now makes the disposal of the dead a question of such difficulty? It was the adoption of the use of a coffin that caused all the mischief. It was in the days of Charles I. that the old simple method was departed from. The ministers of the day disregarded the rubric, "While the body is being made ready to be laid into the earth," or, rather, they read something else into it. A coffin was buried with the body, instead of the body being laid by itself into the earth; hence the choking of the churchyards with the dead in a condition of arrested and prolonged decay; hence the poisoning of the air and the fouling of the water-springs; hence, at last, the intervention of the legislature, and the loss to the Church, for all time to come, of the use of her town churchyards—a partial disestablishment—which a disregard of a plain rubric brought upon her. But

the mischief did not stop here. To Cemetery Companies and Burial Boards was now assigned the control which from time immemorial had been vested in the Church over the ground set apart for burial, and these Companies or Boards could not at a single bound shake off the fetters imposed by evil example and rise to the heights of sanitary science. Suburban cemeteries were conducted upon the same pernicious principles as those which had rendered town churchyards a ghastly dishonouring of the dead, and a flagrant imperilling of the public health. Hence the appalling over-crowding recently disclosed in the Parliamentary returns issued at the instance of the Church of England Burial Reform Association. Nor was this all. The Cemetery Clauses Act, 1847, empowered, and still empowers, companies "to sell in perpetuity the exclusive right of burial." Subsequent statutes confirmed this power within the metropolis, thus overriding the common law doctrine applicable to churchyards, "that no right of burial can be granted in perpetuity."

What now remains to be done? I.—A perishable coffin must take the place of that now in use. II.—The Legislature can concentrate in the Local Government Board the control over cemeteries, now divided between that Board and the Home Office. The Home Office simply concerns itself in seeing that certain Orders in Council, let them be ever so inadequate, be observed. The Local Government Board has control over all local authorities, and can issue stringent regulations as shall render the burial of the dead in accordance with sanitary law. III.—The Church in her corporate capacity can exact a proper use of the churchyards that remain to her, and thus, in these latter days, set a proper example to cemetery authorities. She can compel churchyards to be regarded as for use for all time to come, and so prohibit the use of imperishable coffins and bricked graves, which constitute an unjust invasion upon the rights of generations yet unborn.

Sir CHARLES CAMERON (Dublin) said he had been unable to convince himself of the terrible evils depicted as the result of burying the body in the ground, and he did not believe all those evils followed in any well-kept cemetery. Interments should not be allowed in crypts or vaults or near any large centre of a population, but how the ordinary graveyard in the country could be injurious to health he could not understand. If the directions of the Local Government Board were carried out—and he believed they generally were, if not

it was the fault of Local Authorities—he could not see how burials could be injurious. He did not see how the organic matter in the bodies deposited in an acre of soil could be compared to the immense quantities of organic matter placed upon market gardens. In the large gardens near London 600 or 700 tons of manure were placed on the ground, and surely that must poison the ground and air to a greater extent than cemeteries. He had made examinations of the air about the cemeteries of Dublin, and also of the water that came from drains in those places, and both he had found remarkably free from organic matter. The Local Government Board had done him the honour of quoting a statement he had made, in a letter they had sent to Burial Boards. He had said that the amount of organic matter coming from cemeteries was very small, and if cemeteries were placed outside of large towns he did not see how they could do any harm. In country districts the ordinary mode of interring the body in the ground could not be attended by any harm.

Dr. J. WARD COUSINS (Southsea) supposed the last speaker was not referring to infectious disease cases, and that his remarks applied only to ordinary diseases. They had no reason to expect that such bodies did infect the soil, or that they created any great danger when buried, but in cases of infectious diseases he thought cremation was the better way to get over the difficulty. If there was sufficient evidence that such diseases were due to, and owed their origin to the specific germs or microbes, or whatever they chose to call them, belonging to the organic world, then, he thought, that the bodies of those dying from such diseases should be cremated.

Dr. AXFORD (Southsea) said it was to be regretted that Mr. Lawrence was not that day with them. He, Dr. Axford, felt strongly on the subject that although Mr. Lawrence had done good work in calling attention to the necessity for a better disposal of the dead, he had not gone far enough. No doubt suitable earth will reduce a body to its component elements in about twenty years, but how much better it would be that this should be done in less than as many hours. They were all willing to assist him in the crusade in which he was engaged, but Dr. Axford asked whether cremation was not valuable as an alternative process. He could not help thinking that, as ground was used up for the burial of the dead, the question would become more and more a difficult one. Quite recently there was an addition to one of the burial grounds in that borough, and the question was being discussed as to whether the old ground should not be used over again, and others were suggesting going to Portsdown Hill to bury the dead. To him it seemed a pity to take up land for this purpose when it could be so useful in other respects. If a crematorium were provided some of them thought it would be much better. That question had been discussed by the Burial Board, but there were legal difficulties in the way, and he wished these were absent. Dr. Axford considered the subject of death certificates an important one.

Most medical men were of opinion that death certificates were not what they should be. They should be of a more searching character, and they should be granted only by a Medical Officer appointed for the purpose; and more care should be exercised in the system of registering deaths. He was a very strong advocate of cremation as an alternative process for the disposal of the dead, and he would like to see every Burial Board in towns of above a certain size, compelled to provide a crematorium. The friends of the deceased would then be able to decide whether the body should be buried, or whether it should be submitted to a process by which it would be resolved into its natural elements, quickly and decently, and with no disrespect. Let only the horrible process that went on underground be considered, and there would be little or no question as to which was the best way of showing respect to the dead.

Mr. FRANK R. CHAPPELL (Portsmouth) said that among sanitarians there could be no doubt as to cremation being the best mode of disposal of the dead, but the great objection was public opinion. At present there was a strong sentiment against cremation, and he thought The Sanitary Institute could not do a much better work than to start lectures in all parts of the country to overcome this prejudice. It was only right from a scientific point of view that the sooner the body was resolved into its component elements the better. The placing of charcoal in the coffins was, by the reader of the paper, considered to destroy noxious germs. The error into which the rev. gentleman had fallen should not pass unnoticed, charcoal being simply a deodorant possessing no power to destroy disease germs.

Sir THOMAS CRAWFORD, K.C.B. (London), said that anyone who would wade through the eleven volumes of the proceedings of The Sanitary Institute would be perfectly satisfied that the subject of cremation had been thoroughly discussed by the members of the Institute at the various congresses held from time to time. The greatest authority upon cremation now living was Sir Spencer Wells, who was their President at York, and who took cremation as the subject of his address. As to the necessity of cremation as a protection against contagious diseases he would like to make some remarks. In Benares, where the dead were always cremated, and where no risk from cholera could exist from dead bodies resolving to their elements in the ground, there were constantly recurring outbreaks of cholera. So that cremation did not exempt from that disease. Then in Hyderabad, which was a Mussulman city, the system was burial, but only one body was put in a grave, of course no question as to ground available for such a purpose could arise. He was not aware of any epidemic of cholera having sprung up owing to the system of burial, either there or in any other Mussulman town. With regard to the relative expensiveness of interments or cremation, that was a question of money *versus* sentiment. People who did not wish to adopt with which they as sanitarians had nothing to do. It was a question

cremation would probably be prepared to pay for graves, although at present, cremation was quite as expensive as burial. He agreed with Sir Charles Cameron, that if the ordinary burial ground was kept in a proper state, and was not overcrowded beyond the capacity of the earth to resolve the bodies into their component elements, there should be no danger.

The PRESIDENT of the Section (Prof. Lane Nutter) said it was only living earth that had the power to resolve bodies into their component elements, and some soils had absolutely no power. Dry, sandy soils were of little use to disinfect excreta. A certain percentage of moisture was essential, although this must not be excessive. This should be remembered when earth used for this purpose was artificially dried.

Dr. J. F. J. SYKES (London) said that the Rev. F. Lawrence was not opposed to cremation, but he assumed that there were timid people in the world, who were ruled by sentiment, and to these he suggested a half-way house to cremation in the manner described.

On "Infantile Mortality," by Sir CHARLES A. CAMERON, M.D.

INFANT life is carefully preserved amongst the well-to-do classes. It is rarely that the child of a rich man falls a victim to measles or whooping cough, and if it is attacked by that formidable malady, scarlet fever, its chance of successfully resisting it is very great. On the contrary amongst the poor, measles, whooping cough and scarlet fever commit sad ravages; and children who do not directly succumb to those maladies often die from secondary affections arising from them, as the result of neglect of the little patients. It is sad to think that from 15 to 22 per cent. of the children of the poor perish in the first year of their existence. Were it not for the greater fecundity of the working classes as compared with the rich sections of society, the former would not be able to keep up their relative proportion of the population. Amongst the rich, both birth and death-rates are low; they are high amongst the poor.

The high mortality of poor children is the result of a great

many causes. Defective diet is one which is most common in the first year of life. Poor and otherwise bad milk occasions a large amount of infantile disease. Who can tell how many babies are put to eternal sleep by "soothing syrups," "cordials," "carminatives," *et hoc genus omne!* These narcotics are not—with perhaps exceedingly rare exceptions—given with malign intent, but undoubtedly they are one cause of infant mortality.

Cleanliness of person, clothing and bedding, and purity of air are essential factors in maintaining children in a healthy condition—too generally they are absent from the dwellings of the poor.

The loss of infant life caused by cold and wet is enormous. Young persons are less able to resist low temperatures than adults, yet the former are less warmly clad, even amongst the upper and middle classes. Is it not cruel to allow the tender limbs of young children to be exposed to the cold blasts of winter under the mistaken idea that such exposure makes them hardy! It often lays the foundations of rheumatism and bronchitis.

I am quite convinced that the constitutions of children are weakened by the cold to which they are exposed in winter, owing to want of proper clothing and bed clothes, and of warmth in their dwellings.

It is melancholy to see in the poorer districts of towns so many wretchedly-clad children. Often a little fellow may be observed clothed in the cast-off and ragged garments of his father, sometimes not even adjusted to the child's smaller stature. It is not until boys are able to earn a little money that, as a rule, they get new and suitable clothes. It seems to me that little boys are worse clad, and are allowed to stay out in the streets to a greater extent than little girls. Perhaps this is one reason why the mortality of boys under 5 years old is about 12 per cent. greater than that of girls of the same age; whilst from 5 to 20 the mortality is only very slightly greater in males. It is only when the adult stage is reached that females exhibit for the second time their greater viability.

The following facts derived from the mortal statistics of the population of Dublin prove the appallingly high death-rate which prevails amongst the children of the working classes:—In 1891 the deaths in the families of the professional and independent classes numbered 390; of these 26, or 6.6 per cent., were of children under five years old. In the same year the deaths of persons belonging to the classes of porters, hawkers, labourers &c., and of members of their families, numbered 2,547, of which 1,077, or 42.28 per cent. were of children under five years of age.

In most towns the mortality of children has been steadily decreasing. In Dublin, for example, the yearly average death-rate of children under five years old in the period 1871-80 was 86 per 1000; in the decade ended in 1890 it was 81.7, and in 1891 it declined to 68.6. The statistics of the deaths of children in Dublin differ so much from those of the English towns, that my principal, indeed, only reason for reading this short paper is to bring them under the notice of English vital and mortal statisticians. I have tabulated these statistics as follows:—

Death-rate of Children under One Year of Age in the year 1891.

	All England and Wales.	28 largest English towns.	London.	Dublin.
To 1,000 of the population under one year of age ...	151	168	155	165
To 1,000 of the population of all ages... ..	4.7	5.4	4.9	4.7
To 1,000 births registered...	149	167	154	165
To 1,000 deaths registered...	231	241	229	177

This table shows that a larger proportion of children survive their first year of existence in Dublin than in the 28 largest towns of England and Wales. The rate per 1000 of the population is exactly the same as in England and Wales; but the rates of deaths of children under one year to total deaths is very much less than in the whole of England and Wales. The death-rate of Dublin, though much reduced lately, is still in excess of the English towns. In the period 1881-90 the death-rate (corrected for age and sex distribution) in Dublin was 29.6, in the English towns it was 23. With respect to the preservation of infant life Dublin stands in a slightly better position than the English towns; but the mortality amongst adults very sensibly exceeds that of the large towns of England.

Why this mortality of infants in Dublin is no greater than in English towns, whilst the adult mortality so much exceeds that in the great towns of England and Wales, is a question I do not at present propose to discuss. I may, however, state that summer in Dublin is seldom very warm, and consequently the diseases of children, which, it is well known, high temperature causes or intensifies, are less fatal in Dublin than in England.

Dr. H. W. A. SANDELL (Leighton Buzzard) said that one of the causes in manufacturing districts was the custom of young mothers giving their infants to elderly females to take charge of, while they went to work at the mills, and these women often gave the children opiate cordials to keep them quiet. Then, too, in such cases the children were frequently given unsuitable and unsound nourishment, allowed to run riot, and not taken proper care of in illness.

Dr. J. F. J. SYKES (London) criticised the statistics, and thought the comparison between the deaths under one year with the one thousand deaths at all ages was scarcely reliable, as both factors were variable.

Dr. D. B. KENDELL (Wakefield) said that in dealing with death statistics, an important point was generally lost sight of. It should be necessary when returns were sent from large towns to give some clue as to the relative proportions of rich or poor, because the disadvantages under which poor people lived must have a marked effect on their mortality returns, and the mortality amongst their children must also be greater. Therefore, in speaking of the death-rate of one town being higher than that of another, there ought to be some figures showing the relative proportions of the better class and of the poor, before any idea could be formed as to sanitary conditions.

Dr. TAYLER said that living as he did in a manufacturing district the subject was of interest to him. They had the large ratio of 58 per cent. of deaths among children under five years of age, and the most part were children of the operatives. At one time this was put down to the system of clubs in which the children were entered, and it was thought that parents were wicked enough to want to get rid of the children for the sake of the money they would receive from the club, but on enquiries being made it was found that this was not so. The entering in the clubs was simply a matter of precaution by parents, as the rate of mortality being high, they were afraid that their children might die and they would have no money to bury them with. The cause was found to be the mothers leaving their young babies to the care of other people, often when only three weeks old, while they went out to work. Improper feeding was also a fruitful cause of the high mortality.

Mr. W. SCULLARD (Portsmouth) mentioned a case that came before the Portsmouth Magistrates, in which four children had died, and the fifth was nearly starved. All were insured, and this he thought was one reason for the high rate of mortality.

Sir THOMAS CRAWFORD, K.C.B. (London), thought a large amount of infant mortality was due to artificial feeding. If they walked about the streets of London, they could not but notice the large proportion of children sucking milk of doubtful purity from feeding bottles. It was also largely due to mothers working in factories, and to insanitary surroundings, and cruel neglect including over-laying.

Mr. J. OLDFIELD (London) was disappointed at Sir Charles Cameron not suggesting a remedy. It was one of the most serious things of the day, and he suggested that one cause was bad milk, and another the giving of children of immature age starchy food. At so early an age they could not digest this kind of food, and yet a large proportion of artificial food was starchy. It was a question for Medical Officers to consider what was the natural food for infants, and then to distribute information on the subject, especially pointing out the danger of giving starchy food.

Dr. TREVOR FOWLER (Epping) said he was Medical Officer of Health for a district near London. The rate of mortality among children was not high, compared with the mortality in other districts. The great difficulty was to obtain new milk. Time after time he had advised mothers to feed their children on milk, but he was informed that they could not obtain it, as all the milk was sent up to London. It was practically impossible to get it, and the same complaint came from other rural districts near large towns. Milk could not be obtained at any price, and unless some measure was devised to get it in the rural districts, the rate of mortality would be even yet higher than it should be.

Dr. J. GROVES (Carisbroke) said that taken generally children were less fed with milk in country districts than in towns, owing to the impossibility of the labouring class getting milk in the country. The vendors of artificial foods were alive to this, and they devoted most of their attention to country districts. That was not only his experience, but also that of other Medical Officers of Health in various parts of England. He had encouraged agricultural labourers with large families to club together to keep a cow or two.

Sir CHARLES CAMERON (Dublin) in reply said his sole object was to bring forward some curious statistics with regard to Dublin. If he had gone into the whole question of infantile mortality it would have taken a much longer time. The high death-rate of infants was most deplorable, and he attributed it largely to their artificial feeding. It was, however, often found very much better for children to be fed upon good milk rather than upon the poor milk furnished by mothers living amidst the artificial surroundings of a fashionable life. In the United States very few ladies nursed their own children. The want of cleanliness among the poor was also an important consideration, because often, owing to this, milk turned sour. He agreed as to the starch foods being improper, as children were unable to secrete in their mouths the necessary digestive ferments, and the giving of such food was a cause of disease.

On "*The Physical Condition of Children*," by FRANCIS WARNER, M.D.Lond., F.R.C.P.

HYGIENE is a progressive science, or group of sciences: for its advancement we require knowledge of all conditions affecting the constitution of man, and of the circumstances increasing or depressing public health. State medicine is employed not only to prevent disease and death, but also to favour the evolution of a healthy, well-developed and long-lived population. In presenting a sketch of an enquiry as to the physical condition of 50,000 children seen since 1888, I must first explain the objects aimed at and the methods pursued. The desire of the Committee (a joint Committee of the British Medical Association and the Charity Organization Society) who undertook this work was to make observations and report upon the development and physical conditions of body and brain of school children, to which the report of the teachers as to mental capacity was appended in each of the 9,186 cases of which notes were taken. The points noticed were deviations from the normal conditions below the average; thus the field of observation differed from that of the hospital and asylum in dealing with the school population as a whole; our plan differed from that of the Anthropologists, who seek to determine an average of the class observed, inasmuch as we passed over all children of the normal, or above it, while noting and classifying abnormalities.

As to development of the body (physiognomy, proportions, &c.), the points observed were those well known as common among idiots, imbeciles, and described in many cases as characteristic of the criminal type, viz., defects of cranium, palate, ears, epicanthis, &c. The degree of these defects seen among school children is much lower than among idiots; thus: among the 50,000 cases small heads were found in 1,050 cases, but I think there were only two microcephalic idiots; there were 1,321 cases of defect of form in the palate, but many were only slightly arched or narrow.

When inspecting a school the children are seen usually a standard at a time as they stand in rank, the signs determined on can be observed in each child, and for every case where some deviation from the normal is observed, a schedule form is filled up describing particulars. The work is thus done methodically and easily, without questions being asked of the children. To keep my paper within moderate limits I must pass over the

signs observed as indicative of the nerve-condition,* but the term "Nerve-case" is used as applied to a child presenting any visible deviation from normal nerve-action. The term "Low nutrition," is applied to a child pale, thin, delicate, or with indications of low physical health.

As to the "development cases," are they placed at a disadvantage by their condition? The report shows that 52 per cent. had disordered nerve-conditions, 25 per cent. low nutrition, 40 per cent. were dull. If development defects could be prevented it seems that we should have better average brains, improved strength, and the educational problems would be simplified. The defects are less common among girls than boys, but the power of resistance to adverse circumstances is less strong among girls with low development than with boys. The percentage correlation is given in Table I. (p. 131), and is applied to individual defects. Of 2,003 cases of low nutrition, 1,233 were "development cases" among the 50,000. It appears that for improvement of the population we could not work more effectually than by an endeavour to determine the causes leading to these defects, and attempting to remove them. Some facts in the report are interesting in the direction of Etiology. Among the nationalities there are great differences in the percentage of "development cases," for Jews, 7.5; English, 10.8; Irish, 20.0; details are given in Table II. (p. 135). The percentage of these cases varied in the schools of different districts; Islington, 7.4; Kensington and Chelsea, 12.5. 35,000 children were classified in the day schools of 20 districts, but it is obvious that a much extended enquiry is necessary before the relative condition of the children in the districts can be accurately determined. In schools of upper social class 10,000 children were seen in contrast with 25,000 in day schools of poorer class, and the percentage was to the advantage of the latter. The "small-headed children" form an important group 1,065 (boys 327, girls 738). The condition is found to be twice as common among girls as boys; this suggests searching for a special cause. Among the 50,000 children the percentage of small heads is:—Boys, 1.2; girls, 3.2; both sexes, 2.1. But the distribution in areas is very unequal.

			Percentage of Small Heads.	
	Boys.	Girls.	Boys.	Girls.
Bermondsey,	Boys 1,135,	Girls 773	... 0.1	2.8
Strand,	" 484	" 452	... 1.4	7.0
City of London,	" 321	" 590	... 1.2	6.1
Bethnal Green,	" 718	" 632	... 1.1	.4

* All these signs were described in the Milroy Lectures, Royal College of Physicians, 1892, and in the Author's work, "Mental Faculty," Cambridge University Press.

The children in the Strand schools live, as I was informed, exclusively in large block buildings, and the City schools are surrounded by similar structures. Bethnal Green, on the other hand, is mostly small property. It seems possible that in the case of these small-headed girls we have an example of degeneration due to want of light and air, owing to the character of the buildings.

Inspection of children supplies evidence that appears worthy of attention as affording a basis for the solution of many important social problems. Biologists have led us to look so strongly to the effects of heredity, and the non-survival of weak members in a species, that in social science we have been too apt to lament the want of power to control heredity and remove the defective; perhaps, rather to the neglect of observation of the controllable variations of environment in their effects on the development of the population. What are the effects of elevated sites, drainage, water supply, high buildings, narrow streets, adjacent railways, open spaces, &c.? An answer may be sought by observations of children living under varied circumstances, and by analysis and comparison of the results.

I am not prepared to assert that "development cases," with their attendant evils, are degenerations from the normal of modern occurrence, or even that they are degenerations at all; a high percentage of such children in a community may indicate a condition of the people as yet unevolved with latent capacity for higher evolution of a normal, under wise guidance a better and more uniformly good type may spring up, leading to increased average brain power, more capacity for resistance to adverse conditions, and increased longevity.

Inspection of children has already afforded much useful knowledge, the accumulation of which, year by year, would in time show the conditions of evolution or degeneracy which may be going on among us; at the same time such studies would probably afford evidence as to causation of changes occurring, and the means of prevention and cure for many existing evils.

Details of the signs observed, and their significance, have been published; a full report on the results of this enquiry has been prepared and presented to the Local Government Board, and a Committee is now actively engaged in furthering this enquiry, so that in a year or two we may have a basis of facts accumulated showing new directions in which Hygiene may advance the general well-being of the people.

TABLE I.—Showing Number of Children with each Defect in Development, also giving their Correlations. Percentages are taken on number of cases presenting the defect.

	Total of cases presenting each defect among 50,000 children.		With abnormal nerve signs.				With low nutrition.				Reported dull by Teachers.					
	Boys.	Girls.	Number of cases.		Percentage of cases.		Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Number of cases.		Percentage of cases.	
			Boys.	Girls.	Boys.	Girls.							Boys.	Girls.	Boys.	Girls.
Total of "Development cases"	3,616	2,235	5,851	1,975	1,096	54.6	49.0	732	726	20.2	32.0	1,398	928	38.3	38.7	
Cranial abnormalities	1,528	1,048	2,576	850	531	55.6	50.6	392	480	25.7	45.8	634	477	41.4	45.5	
Defects of palate	796	525	1,321	441	262	55.4	48.9	173	155	21.7	28.9	324	232	40.7	43.3	
Defects of external ear	1,047	268	1,315	566	128	54.0	47.7	196	72	18.7	26.8	310	103	32.4	38.4	
Epicanthis	514	384	898	227	160	44.1	41.6	65	73	12.6	19.0	192	136	37.3	35.1	
Children small for age.....	209	209	418	119	110	56.9	52.6	88	101	42.1	48.3	78	79	37.3	37.3	
Nasal bones deformed.....	241	214	455	131	95	54.3	44.3	16	19	6.6	8.8	87	77	36.1	36.0	
Features large or coarse	147	194	341	112	68	76.1	65.3	19	17	12.9	16.3	75	43	49.6	41.3	
Palpebral fissures small	98	83	181	61	57	62.2	68.6	22	16	22.4	19.2	41	39	41.8	47.0	
Mouth small	27	17	44	16	10	59.2	58.8	8	2	29.6	11.7	8	10	29.6	59.8	

TABLE II.—Groups of Schools, giving the Number of Children seen, and Percentage of Conditions taken upon the Number of Children seen.

	Boarding Institutions.		Day Schools.		English Day Schools.		All Irish Schools.		Jew Day Schools.		Day Schools of Upper Social Class.		Poorer Day Schools.	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
No. of Children seen.....	8,246	5,403	18,638	17,740	16,932	15,875	1,694	594	1,389	1,572	5,281	4,934	13,357	12,806
Percentage noted	24.1	17.7	19.1	14.9	19.2	14.9	35.5	19.3	17.7	18.8	21.2	16.1	18.3	14.4
Percentage of Development cases	16.0	12.4	12.2	8.8	12.5	9.0	22.4	12.9	8.3	6.8	14.3	8.5	11.4	8.9
Nerve cases.....	16.1	10.3	11.1	8.6	10.9	8.5	25.6	11.9	11.1	8.3	12.7	10.5	10.5	7.7
Low nutrition	3.5	2.8	3.9	4.6	3.9	4.7	4.9	5.8	3.0	2.4	4.8	5.6	3.6	4.2
Reported dull.....	9.7	8.1	7.5	5.7	7.8	5.7	14.3	9.7	4.6	5.6	8.7	5.8	7.1	5.7
Eye cases.....	3.4	2.9	2.9	2.6	2.3	2.6	4.8	4.5	3.3	2.7	3.1	2.9	2.8	2.5
Cranial abnormality .....	.....	.....	.....	.....	4.5	3.8	11.2	5.2	3.3	3.2	3.2	3.2	.....	.....
Palate defective.....	.....	.....	.....	.....	2.7	2.0	4.7	4.7	1.1	1.2	1.2	1.2	.....	.....
External ears defective .....	.....	.....	.....	.....	3.6	0.9	6.9	1.1	3.0	1.4	1.4	1.4	.....	.....
Epicanthis .....	.....	.....	.....	.....	1.8	1.5	2.1	1.3	0.8	0.7	0.7	0.7	.....	.....
Other defects in development .....	.....	.....	.....	.....	2.6	2.3	7.7	5.8	2.3	1.9	1.9	1.9	.....	.....

Mr. J. OLDFIELD (London) said that with regard to the higher percentage of small heads among girls than boys, mere consideration of the present would not account for it. But going back to the early times of the origin of man and woman, they found that woman depended upon man for her very existence. Man was the dominant animal, and so woman got to look up to him as being necessary for her existence. Man, being the stronger, was her leader. It was only in recent years that the equality of the sexes was recognised. But even now, if there was only a crust in the house the woman would take nothing and give it to her husband. This was a relic of the chivalry of woman. She looked up to her husband, made sacrifices for him. The same rule applied in every act of her life. If there was a dark room in the house, it was given to the girls and not the boys. It was the boys who were put to the public schools, and the girls had to give way. This relationship applied in all the laws of nature. It appeared as if the male was more important than the female. If there was not enough nutriment for both, both must die or one must be sacrificed for the sake of the other. It was more necessary apparently that the male plant should survive, and among animals there was a greater robustness usually found among males than among females. But although the girl might be inferior to the boy physically, yet ethically, by her very self-sacrifice for the sake of the boy, she proved herself his superior.

The Route of Asiatic Cholera in 1892, by DAWSON WILLIAMS, M.D.

IN the short paper which I have ventured to undertake to read on the subject of Cholera, I shall confine my remarks to certain points as to the mode of spread of the present epidemic. The literature of Cholera is enormous in amount, and most heterogeneous in character; it ranges from the portly folios issued by the Indian Government to the telegrams in yesterday's newspaper, the one elaborate and authoritative, but published a year or longer after the event, the other prompt indeed, but either founded on popular rumour or on official statistics which are not always entirely trustworthy. Municipal, and sometimes it is possible even state authorities appear to consider that they are serving their own interests by concealing facts as to the existence and progress of epidemic disease; such concealment is seldom successful for more than a very limited period, and in its ultimate effects on the commerce

of the country and the public health of other nations it is as disastrous as the attempt is disingenuous.

Even so much information as is made public abroad is only to be obtained in England through non-official channels. The Government of this country, though from several points of view more interested than any other, and possessing unrivalled opportunities, has no machinery by which it can gather and compare facts as to the progress of epidemics abroad. British ships may sail for infected ports, and, as was recently the case at Santos during the epidemic of yellow fever there, the mortality among the crews on arrival may be so great that the vessels are unable to return, yet it is only after the facts have become matter of public notoriety and scandal that a Government Department issues a tardy notice warning ship-owners of the danger.

The *Comité Consultatif d'Hygiène* of France has earlier and better information as to the movements of Asiatic Cholera than can be gathered in this country, and the United States has, from time to time, obtained special reports from its Consuls on the existence and progress of epidemic diseases. There is not in this country any public office or department whose duty it is to deal with questions of public health as they affect the relations of the United Kingdom with its colonies and dependencies, and with foreign countries. The Local Government Board is concerned only with internal administration in England, and neither the Foreign Office nor the Board of Trade has been provided with the necessary medical advisers. It appears to be highly desirable that our Consuls abroad should be instructed to report promptly the presence of such epidemic diseases as cholera, yellow fever, small-pox and plague; such reports, after being epitomised by an officer appointed for the purpose, should be placed at the disposal of the public, either by means of notifications in the Gazette, or by being communicated directly to the public press, in the same way as the daily notices of the Meteorological Office are now issued.

In tracing the progress of the present epidemic of Cholera it does not appear to me to be necessary to include a consideration of the occurrence of the disease last year in Syria, or its recrudescence there this summer. There is no evidence of any spread from Syria either northward or westward; on the contrary, all the evidence goes to prove that Asiatic Cholera reached European Russia this year by a track differing altogether from those followed during the last half century, though nearly approaching the route taken by the earliest epidemics which reached this country. Speaking broadly, Asiatic Cholera has followed three main routes from India to Western Europe.

(1) It has passed through the North-west Provinces of India into Afghanistan, and thence along the caravan routes by way of Balkh, Bokhara, and Kliiva to Orenberg in Russia, (1829, 1843-4); (2) it has spread from Southern India up the Gulf to Persia, and radiated south-westward to Syria and Egypt, and north-westward across Persia to the Caspian Sea, thence to Astrakhan on its western shore, and from that port up the Volga to Saratov and Kasan (1830); (3) it has been transported, mainly in relation with the pilgrim traffic, to Red Sea ports, has gained Egypt, and spread thence to the Mediterranean basin. Since 1865 the epidemic has always, until this year, taken the last mentioned route, and the attention of international conferences has been, in the main, confined to devising precautions for protecting Europe from invasion by way of the Red Sea and Egypt.

This year the epidemic has once more followed a northern course, and has afforded one more striking illustration of the readiness with which Asiatic Cholera can be conveyed along lines of human intercourse.

Cholera appeared in Afghanistan late last year, and caused a considerable mortality in Cabul; during the winter months (January and February) the epidemic died down, but in March, 1892, there was a severe outburst, and the disease continued to be epidemic for several months. In March also the disease had reached Herat, in North-western Afghanistan, and was producing several hundred deaths a day. Two months later it had become established in Meshed in North-eastern Persia, and spread slowly thence to Mishapur, Sabzawar, Abbasabad, and Shahrud, only reaching Teheran some two or three months after its appearance in Meshed.

Very different from this slow march of the epidemic westward through Persia from Meshed, was its swift progress once it touched Russian territory. The disease was recognised at Askabad during the first days of June, having in all probability spread there from Meshed a little earlier. At Askabad the epidemic reached the Transcaspian Railway, which runs from the eastern shore of the Caspian Sea, through Askabad and Merv, to Bokhara and Samarcand.* Cholera spread eastward and west-

* Since this paper was written, some statistics of the Transcaspian Railway have been published by the *Journal of the Ministry of Finance* in Russia (*Times*, Nov. 22nd, 1892). The length of this line is nearly 900 miles. The number of passengers in 1891 was 202,408, exclusive of about 40,000 soldiers. Further evidence of the growth of traffic is afforded by the fact that the export of Russian goods has more than doubled since the line was completed in 1889. Large quantities of Indian tea are imported into Russia by this route.

ward along the course of the railway with great rapidity. Nor was its progress arrested, or even checked by the Caspian Sea, for its presence in Baku on the western shore was admitted officially within a fortnight of its recognition in Askabad, and private telegrams show that it had undoubtedly been present for a week or ten days before this. Baku is an important trade-centre. It is the terminus of the Transcaucasian Railway which brings it into direct communication with Black Sea ports, while steamboats on the Caspian connect it with the terminus of the Transcaspian Railway, and with Astrakhan, the southern outlet of the trade of the Volga. The spread of the epidemic in Baku itself, favoured by the existence of gross sanitary defects, and by the want of competent municipal government, was rapid, and even the brief telegraphic despatches have given a picture of social disorganisation which can hardly be equalled in the whole terrible gallery which Asiatic Cholera has provided for the punishment and instruction of mankind.

With Cholera raging in Baku, and with an inept administration relying entirely upon quarantine regulations illogically planned and imperfectly carried out, it was no matter of surprise to find that the epidemic found its way eastward along the Transcaucasian Railway as far as Tiflis, and northward by the Caspian boats to Astrakhan. How early the last named city was infected is not, and probably never will be, known; when the presence of the epidemic in Astrakhan was recognised officially, it was already prevailing in Saratov, some 500 miles higher up the river, and a week later was reported from Kostroma, to the north-east of Moscow.

Within a month, therefore, of the recognition of Cholera at a town on the Transcaspian Railway it had penetrated to the heart of Russia in Europe, the transit from Central Asia having taken as many days as, before the creation of railways and steamboat lines, it took months. The recognition of the significance of this fact is, perhaps, the most important lesson which the present epidemic has as yet afforded.

Having traced the progress of the epidemic from Afghanistan to Persia with great probability, and from Persia to Russia in Asia, and from Russia in Asia to Russia in Europe with precision, it remains to enquire how the infection reached Afghanistan. As to this there is room for some difference of opinion. It is natural in the first instance to turn our thoughts to the Hurdwar Fair, the continuance of which the Government of India found it advisable this year to prohibit on account of the danger of the dissemination of Cholera. This great assembly of people, brought together primarily by a religious object, is frequented by pilgrims and traders from the

north-western provinces, by Kashmirees and Border men. The prohibition was not completely effective, and many of those who reached Hurdwar at an early date, or eluded the vigilance of the officials at a later, undoubtedly carried Cholera for considerable distances. There is strong reason to believe, though the fact cannot be positively affirmed, that the disease was thus conveyed to Srinagar, the capital of Kashmir, where a severe outbreak occurred in May. While it will be admitted that the accumulation of a huge multitude of people at Hurdwar in the early spring, and their dispersal in every direction throughout North-western India and the frontier countries is a fact, the significance of which for Europe is greatly increased by the proof now afforded that Cholera may be carried in a few weeks from the confines of Afghanistan to European Russia, it appears that the Hurdwar fair is not in any way responsible for the movement of Cholera this year.

As has already been said cholera was epidemic in Afghanistan at the end of 1891. A month or two earlier—in September—an outbreak had occurred amongst labourers in the Hoti Mardan district of the Peshawar division; there appears to be little doubt that this outbreak was originated by men coming from Swat, and other independent territories to the north-east of Peshawar. The labourers immediately dispersed, many fleeing to Peshawar, where an epidemic of a peculiarly fatal character occurred both in the town and in the Pathan villages in the immediate neighbourhood. The mortality in some of the villages in the valleys towards the eastern mouth of the Khyber Pass was particularly severe. At a later date many villages in the Shinwari country lying to the north of the western end of the pass were ravaged, and towards the end of the year Cabul itself was attacked, as already said.

It does not seem to be necessary to refer at any length to the spread of the epidemic to Hamburg; its dependence upon the line of emigration from Russia appears to be probable, and the likelihood of the occurrence of cases among emigrants arriving at that port from infected districts *en route* for England and America ought to have been foreseen, and provided for, by the authorities in Hamburg. This does not seem to have been the case, and insanitary conditions appear to have been allowed to prevail, of which we now see the inevitable consequences. Neither does it come within the scope of the present paper to discuss the nature of the choleraic disease which prevailed in Paris this summer.

In conclusion, I would venture to make the following observations:—

(1) The greater rapidity of transit has increased the pro-

bability of the importation of Cholera and other epidemic diseases from Central Asian countries to European Russia, and thence to Europe in general.

(2) Asiatic Cholera, in travelling by land routes, depends for its power of continued progress mainly upon the existence of insanitary conditions in towns in which traffic is temporarily arrested for transshipment or otherwise. The necessary delay affords time for persons from infected districts to be attacked by the disease, and so to infect the place at which the halt is made. Such places become fresh centres from which the disease spreads along lines of traffic. This fact is well illustrated by the history of the present epidemic in Baku and in Hamburg.

(3) Quarantine has once more shown itself to be a most ineffectual method of checking the spread of Cholera. Quarantine, for instance, between Baku and Astrakhan utterly failed to prevent the spread of the infection to the latter town.

(4) On the other hand, medical inspection of travellers, especially of those of the poorer emigrant class, combined with isolation of doubtful cases, appears to be once more showing itself to be an effectual method. At the same time it must be recognised that no method can be effectual in the absence of good sanitary conditions in ports and other centres of transshipment or temporary arrest of traffic. In fact it may almost be said that the only effectual method of excluding Cholera is to ensure that its infectious principle, in common with that of other diseases of similar nature, shall be excluded from water-supplies.

(5) The need for more precise, earlier, and more authoritative information as to the existence of epidemic diseases in all civilised countries is urgent, and, pending the organisation of an international understanding upon the subject, it appears to be desirable to urge upon the Government of this country the creation of an Epidemic Intelligence Department in connection with the Local Government Board. This Department should collect and collate the information in the possession of that Board, of the Board of Trade, and of the Foreign Office.

(6) The presence of Asiatic Cholera this summer and autumn on the Transcaucasian Railway should not be lost sight of, as a recrudescence may occur next spring, and lead to infection of Batoum and Poti, and thence of other Black Sea ports.

On "*The Sanitary Influences of Harbours and Exposed Fore-shores,*" by J. WRIGHT MASON, M.B., C.M., D.P.H., Medical Officer of Health, Town and Port of Hull.

THE subject which I have been entrusted by the Council to bring under the consideration of this Congress, viz., "*The Sanitary Influence of Harbours and Exposed Foreshores,*" is now receiving the attention not only of the Local Government Board, but of all Authorities exposed to the danger of a possible invasion of cholera into this country.

Our security against the possible invasion of cholera depends upon the preparedness or otherwise of our first line of defence, and it should be the duty of every Port Sanitary Authority to seek out and remedy any defects in their sanitary administration. The unreadiness to act in emergency leads to a want of confidence and consequent panic, producing a depressing influence upon the mental and moral force of a population.

The epidemic of cholera which now threatens the whole of Europe, first appeared, according to a high authority, in the provinces of North-Western India, during the months of March and April, amongst the pilgrims visiting the Hurdwar Fair, near the source of the Ganges. From thence the disease spread through Cashmere and Afghanistan, reached Persia during the months of May and June, spread through the population of Asiatic Russia, from whence it has made rapid progress through European Russia, and since April has extended in a north-westerly direction.

According to Cornish the history of cholera is very apt to repeat itself, and therefore we may reasonably presume that the same circumstances which happened in 1831 are very likely to repeat themselves in 1892, and succeeding years; the route taken by the present epidemic being almost identical with that which pervaded Europe in 1831.

During the visitation of cholera in 1832, England became invaded by means of the sea route from the Baltic, and in 1849 the visitation travelled in much the same direction.

In 1853 the disease took a similar course, Norway, Sweden, Denmark, and the Baltic Ports being attacked before reaching this country.

The line of human inter-communication between the East and Europe, in 1865 and 1866, had undergone a change. The Cape route had given way to that across Egypt and the

Mediterranean, and cholera in those years first attacked Southern Ports.

The construction of the Suez Canal opened up a direct route between our Indian possessions and Europe; and the disease in 1884 and 1887, was conveyed by a French transport from Tonquin to one of the Mediterranean ports of France.

More recently the line of railway laid down by Russia has superseded the old desert course, and it is by this new railway route, through Turkestan, that cholera has this year reached Europe.

Directly the Asiatic ports of the Caspian were attacked, the disease soon traversed Baku and Astrakan, attacking towns south of the Caucasus, and hence the danger of the invasion of cholera to our Eastern ports of the Baltic.

Cholera follows the line of international communication, and with modern increased facilities for rapidity of transit, so is the danger of its possible invasion increased by emigration or otherwise. The experience of previous epidemics has shewn that the progress of cholera is greatly influenced by seasons and atmospheric conditions, and after lasting for a period of about three years, the epidemic force seems to have expended itself.

As a result of the Sanitary survey made in anticipation of cholera in 1885 and 1886 by Drs. Ballard and Blaxall, on behalf of the Local Government Board, much has been done to perfect the first line of defence, by the consolidation of joint authorities for purposes of administration, medical inspection (either for the purpose of investigation as to the causation of disease, the removal of sick persons to hospital, or the remedying of sanitary defects), and the institution of hospitals (either by themselves or in conjunction with others), and disinfecting stations.

Quarantine has now been practically abolished. The Quarantine Act of 1825 still exists, but is never enforced, except in cases of yellow fever. Quarantine stations which once abounded around our coast have now disappeared, and I believe Liverpool is the only port which still retains a Quarantine officer, appointed by the Customs authority to carry out the Act in cases of yellow fever and plague, and by a general order of that body, he is instructed to inspect all ships arriving with infectious disease on board (except cholera) and should the disease be plague or yellow fever, he is to place them in quarantine.

In the case of other infectious diseases, the Customs Officer is directed to communicate the fact to the Medical Officer of Health, who then takes charge of the patients and ship.

Under the Cholera Regulations (general) issued by the Local Government Board, 1890, the Sanitary Authority, on notice being given to them by an officer of Customs, shall cause the

ship in regard to which such notice has been given to be visited and examined by the Medical Officer of Health, to ascertain whether she is infected with cholera; or the Medical Officer of Health, if he has any reason to believe that such ship coming or being within the jurisdiction or district of the Sanitary Authority, whether examined by the officers of Her Majesty's Customs or not, is infected with cholera, shall, or if she has come from a place infected with cholera, may, visit and examine such ship, for the purpose of ascertaining whether she is so infected, and the master of such ship shall permit the same to be visited and so examined.

If, on examination, he shall declare the ship to be infected with cholera he shall give a certificate (in duplicate) to the master and retain a copy to be transmitted to the Sanitary authority.

The master of the ship so certified shall then moor or anchor the ship at the place fixed for that purpose, and shall remain there until the requirements have been fulfilled. No person shall be allowed to leave the ship, and the medical officer shall next proceed to examine every person on board the same, and any person suffering from cholera or any illness which the medical officer may suspect to be cholera he shall certify accordingly. Any person not so certified shall be permitted to land immediately on giving to the medical officer of health his name and place of destination, stating, where practicable, his address at such place. The names and addresses of such persons shall be given by the Medical Officer of Health to the clerk of the Sanitary authority, and he shall thereupon transmit the same to the local authority of the district in which the place of destination of such person is situate.

The person certified to be suffering from cholera shall be removed, if his condition admit of it, to some hospital or suitable place, and he shall not leave such hospital or place until the Medical Officer has certified that such person is free from disease, or if the person cannot be removed, he shall remain on board the ship and shall not be removed from, or leave, without the consent in writing of the Medical Officer of Health. Any person certified by the Medical Officer of Health to be suffering from any illness, which such officer suspects may prove to be cholera, may either be detained on board the ship for any period not exceeding two days, or be taken to some hospital or other suitable place appointed for that purpose, and detained there for a like period, in order that it may be ascertained whether the illness is or is not cholera.

The Medical Officer of Health shall give such directions, and take such steps as may appear to him to be necessary to prevent

the spread of the infection. In the event of any death taking place whilst the ship is detained, the master shall, as directed by the Sanitary authority, or Medical Officer of Health, either cause the dead body to be taken out to sea, and committed to the deep, properly loaded to prevent it rising, or shall deliver it into the charge of the said authority for interment, and the authority shall, thereupon, have the same interred.

Lastly, the master shall cause any articles soiled with cholera discharges to be destroyed, and clothing, bedding, and other articles of personal use likely to retain infection, which have been used by any person who may have suffered from cholera on board such ship, or who having left the ship, shall have suffered from cholera during the stay of such ship in any port, to be disinfected, or (if necessary) destroyed, and if the master shall have neglected to do so before the ship arrives in port, he shall forthwith, upon the direction of the Sanitary authority, or the Medical Officer of Health, cause the same to be disinfected and destroyed, as the case may require, and if the said master neglect to comply with such direction within a reasonable time, the authority shall cause the same to be carried into execution. The master shall cause the ship to be disinfected, and every article therein, other than those last described, which may probably be infected with cholera, to be disinfected or destroyed, according to the directions of the Medical Officer of Health.

With the development of cholera and its possible spread through the importation, firstly, of rags from France; secondly, of rags, bedding, or disused or filthy clothing, whether belonging to emigrants or otherwise, from any foreign port in Europe north of Dunkirk; and thirdly, from any port in the Black Sea or Sea of Azov, whether Russia, Roumania, Bulgaria, or Turkey, or from any other port in Turkey in Asia, regulations have been issued by the Local Government Board, that no rags, &c., shall be delivered overside except for the purpose of export, nor landed in any port or place in England or Wales. Further, if any such rags, bedding, or clothing shall be delivered overside or landed in contravention of this Order, they shall, unless as forthwith exported, be destroyed by the person having control over the same, with such precautions as may be directed by the Medical Officers of Health of the Sanitary Authority within whose jurisdiction or district the same may be found.

Recent important additional precautions have been issued by the Local Government Board, amending the General Regulations of 1890.

Article 12 of that Order is so amended, that a person shall

not be permitted to land unless he satisfy the Medical Officer of Health as to his name, place of destination, and address at such place.

Secondly, by an order dated 31st August, 1892, if the medical officer of health have reason to believe that any ship coming or being within the jurisdiction of the Sanitary authority is infected with cholera, or has come from a place infected with cholera, he may direct the bilge water to be pumped out before such ship enters any dock or basin; and on the Sanitary authority providing a proper supply of water for drinking and cooking purposes for persons on board the ship, he may direct all casks or tanks on board the ship containing water for the use of such persons to be emptied, and the master shall cause the said directions to be carried into effect. I have long since caused this precaution to be carried out, and instructions have been given to masters of all ships that they should not take in drinking water at an infected port, unless the quality of the water admitted of no suspicion, and that all bilge water should be pumped out before entering the dock, and this (during the present epidemic), I took an early opportunity of representing to the Local Government Board.

The frequent and short communication of the northern ports (more particularly Hull and Grimsby) with German and Baltic Ports (averaging from 30 to 36 hours), and the number of Russian emigrants arriving *en route* for America, via Liverpool, has exposed these respective ports to considerable risks and danger of the importation of cholera. Ships may arrive with crew, passengers, and emigrants all well on board, yet cholera may possibly become developed amongst the crew whilst remaining in the port, or amongst the emigrants during their transit to Liverpool, or when remaining there previous to their final departure for America. The port has, therefore, to depend upon not only its first, but also its second line of defence, and it is necessary to use every precaution by disinfection of the temporary lodging accommodation provided for their reception, pending their departure.

I have dealt somewhat at length with cholera, but why should not the same regulations apply to ships affected with yellow fever, and I would suggest that it should be compulsory for all vessels with infectious diseases on board to be detained, awaiting medical inspection.

The present regulations do not admit of vessels being detained having cases of small-pox, diphtheria, scarlet fever, and measles on board.

A hospital fully equipped with a disinfecting station and ambulance is a necessity, either a floating hospital for conveni-

ence and administrative purposes, or so situate as to be in immediate contiguity to the Docks, provided, if possible, with a landing stage, in order that patients may be admitted with the least possible publicity and exposure. The hospital should be provided with a distinct system of drainage otherwise than that connected with the town's sewage system.

Wards should be appropriated not only for the treatment of special diseases, but distinct wards set apart for the treatment of doubtful cases. The usefulness of such hospitals is often defeated by charges being made for admission, and it would be well, since such hospitals are erected for the maintenance of the public health, that they should be free for the reception and isolation of infectious cases.

A well-organised staff of trained and skilled inspectors is all-important.

Our ports being in direct communication with all parts of the world, renders it necessary that the second line of defence against the possible introduction of cholera or other diseases should be well protected, and the early preparations against the means by which such diseases, if imported, naturally spread, should be calmly studied, thought out and perfected in the interim.

Special attention should be directed towards a pure and unpolluted water supply, the periodical and regular removal of all excreta and refuse matters in the midst of populations, the frequent flushing of all drains and sewers, the prevention of overcrowding, the systematic inspection of common lodging-houses, lastly but not least, our food supplies. These are necessary adjuncts in the sanitary administration of the gateways to our country, and our foreshores should not be exposed to the nuisance and dangers of the deposition of towns' sewage along the banks of our tidal rivers. The dangers to which they are naturally exposed, from a public health point of view, is compensated by their geographical position, if their sanitary administration is carried out in the spirit of modern preventive medicine.