

**Inaugural address / by Joseph Fayrer, Bart., K.C.S.I., LL.D. Edin & St. And., M.D. Edin., F.R.C.P. Eng., Q.H.P., F.R.S.**

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# THE SANITARY INSTITUTE.

CONGRESS AT BIRMINGHAM, 1898.



## INAUGURAL ADDRESS

BY

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## INAUGURAL ADDRESS,

BY SIR JOSEPH FAYRER, BART., K.C.S.I., LL.D. EDIN.  
& ST. AND., M.D. EDIN., F.R.C.P. ENG., Q.H.P., F.R.S.

(FELLOW.)

*Delivered September 27th, 1898.*

MY first duty on taking the chair is to acknowledge the honour conferred on me in selecting me as President of this Congress; and my next to offer a cordial welcome to all who propose to take part in its proceedings, and to express a hope that they may not only derive pleasure and profit from them, but at the same time confer benefit upon the cause they advocate.

It is also my duty to convey the thanks of the Congress to the Right Honble. the Lord Mayor and Corporation for the hospitality and courtesy which has been extended to it in the important city of Birmingham, a great and populous centre of activity, to which the problems to be considered in the forthcoming conferences must be of deep and abiding interest.

It is not without misgiving that I have assumed the office entrusted to me, for when I think of those who have been my predecessors, I feel painfully conscious of my inaptitude for the post that they have filled so well. I must confess, moreover, that I found some difficulty in selecting a topic suitable for an inaugural address, but can only hope that my shortcomings may be redeemed by the proceedings of the various sections into which the Congress is divided.

I shall not attempt to deal with any special branch of

preventive medicine or hygiene, but shall endeavour to take a brief general survey of progress during recent times. It should be a retrospect full of interest, offering scope for many addresses on special branches of sanitary science—such, indeed, as I hope will characterise the coming Conference.

We live in an age of progress and discovery. Intellectual activity has never been greater, scientific research never more profound or far-reaching, whilst the practical applications of the discoveries of science are not less remarkable. Among many subjects of interest which were laid before our gracious Queen on the completion of the sixtieth year of her glorious reign, few perhaps if any afford better ground for congratulation than the improvement in the vital statistics of her people, as shewn by reduced death-rate, enhanced expectation of life, decline in some of the most potential death-causes, and the almost total disappearance of others.

In effecting this improvement, the Institute which I have the honour to represent and which holds its 17th Annual Congress this year has taken an important part. It was the outcome of the impulse given to sanitary science by the Public Health Act of 1875, which itself was a result of the growing conviction that public health was a subject which demanded more consideration than it had hitherto received.

At a public meeting held in London in July, 1876, presided over by His Grace the Duke of Northumberland, it was resolved that the sanitary condition of the country is still very unsatisfactory, that further legislation is necessary with a view to its improvement, and that for the purpose of collecting and imparting information upon all matters connected with the subject of "Public Health," a society be formed to be styled "The Sanitary Institute of Great Britain," and a committee was appointed to give effect to the terms of the resolution. Since then the progress of the Institute thus founded has been uninterrupted, and its influence for good has steadily increased. In the same year, 1876, the Parkes Museum was founded at University College as a memorial to Dr. E. A. Parkes, first Professor of Hygiene at Netley, and in its galleries were exhibited various hygienic appliances for the purpose of affording information by the objective method of teaching. Its Council originated and managed the International and Sanitary Exhibition at South Kensington in 1881, which was presided over by the Duke of Edinburgh. It was in 1882 incorporated as a society, its treasures were transferred to the present premises in Margaret Street, where it was joined by the Sanitary Institute, and the two institutions having a common object worked harmoniously together and practically became one. In August,

1888, they were formally amalgamated and re-incorporated under the title of The Sanitary Institute. In 1887, just before the amalgamation took place, the Institute, in conjunction with the Society of Medical Officers of Health, invited the International Congress of Hygiene and Demography to meet in London, which it did in 1891 with great success.

The object which the Institute has kept steadily before it from the outset has been the advancement of sanitary science by the promulgation of sound scientific and practical teaching of those principles on which health depends, by which life is prolonged, and the physical and thereby the moral welfare of the people promoted.

One of its earliest steps, taken in 1877, was to establish examinations for Local Surveyors and Inspectors of Nuisances, in order that the officers who had to carry out the provisions of the Public Health Act should be competent for their duties. The Council also arranged to hold an Annual Congress in some provincial town, in order that papers should be read and discussions take place, whilst, at the same time exhibitions of sanitary appliances were arranged as object lessons, and judges appointed to examine the exhibits and award prizes. Since the amalgamation with the Parkes Museum the same work has been continued, with the addition of periodical meetings, at which papers are read and discussed, the publication of transactions, and advanced examinations; while to aid the important teaching work it was carrying on, it collected and published the works of Farr and of Simon, which deal exclusively with the problems of sanitary science. It has gradually accumulated an excellent library, and instituted lectures and practical sanitary demonstrations for the benefit of medical men and of sanitary inspectors, which subsequently were considerably extended and more elaborately organized. Under the patronage of the Duchess of Albany and the Presidency of the Dukes of Northumberland and Westminster, and latterly of the Duke of Cambridge—who had already been connected with the Institute for fourteen years, and had not only displayed great interest in its work, but had rendered it valuable assistance, and under the guidance of such men as Sir Douglas Galton, Earl Fortescue, Sir Francis Powell, Mr. Rogers Field, Prof. Corfield, and others who had been its early supporters and founders, it steadily developed its purpose of diffusing practical sanitary knowledge throughout the country and attained its present influential position.

An idea may be gained of the scope of the operations of the Institute by reference to the epitome of the work done in 1897, which was as follows:—

LONDON LECTURES AND EXAMINATIONS.		Total
		Attendance.
4	Sessional Meetings for discussion of Sanitary Subjects	285
36	Lectures to Sanitary Officers ... ..	2,251
2	Special Demonstrations, Inspection of Meat ...	140
34	Practical Demonstrations for Sanitary Officers ...	925
2	Examinations in Practical Sanitary Science ...	34
2	Examinations Sanitary Inspectors ... ..	213
38	Classes brought to the Museum ... ..	1,674
	Other persons visiting the Museum (estimated) ...	17,500

#### PROVINCIAL EXAMINATIONS.

8	Examinations Sanitary Inspectors and Practical Sanitary Science ... ..	316
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#### CONGRESS AND EXHIBITION AT LEEDS.

6	Sectional Meetings ... ..	706
8	Conferences ... ..	850
3	Addresses and Lectures ... ..	956
	Exhibition open for 23 days, at which a number of Lectures and Demonstrations were given ...	75,790

All this is effected entirely by private enterprise, unaided by any subsidy either from Government or other public authority, by which it is from time to time consulted, and to which its services are most willingly rendered. As an illustration of the progress made it may be stated that when the first Congress took place in 1877, there were 150 members and the income was £240. In 1897 the members were 2,100 and the income £6,000. In 1877 five candidates were examined for certificates, in 1897 521 were examined, of whom 300 obtained certificates.

Such is a brief outline of the history of The Sanitary Institute. But it is by no means the only source of instruction in matters relating to Hygiene and Preventive or State Medicine, for all our Medical Schools and Universities, the Army and Navy Medical Schools at Netley and Haslar, and many technical schools now give instruction in those subjects, and the Universities and Colleges of Physicians and Surgeons attest the fitness of candidates for the Diploma of Public Health. One great national reproach, moreover, has lately been removed by the foundation, by private enterprise of the Institute of Preventive Medicine, under the presidency of Lord Lister, with which is amalgamated the College of State Medicine. The object of this Institution is to search out the causes of disease, a knowledge without which we cannot hope to deal effectively with modes of prevention. The Medical

Departments of the Navy, the Army, and the Local Government Board, the Army Sanitary Committee, the Royal Institute of Public Health, many municipal and rural Health Societies, and Societies of Medical Officers of Health, are actively employed in extending the practical application of the knowledge imparted by the various educational institutions as well as by individual research.

The time at my disposal does not permit of tracing in detail the history of the growth of Sanitary Science from times of ignorance and superstition to its present well-established foundation on a scientific basis, but I may at once say that it is indeed only comparatively recently that preventive as distinguished from curative medicine has assumed the position of a science at all; it is now from a hygienic point of view, the more important of the two, though the difficulties attending its application are still considerable and largely such as arise from ignorance and incredulity.

Half a century ago the great mass of the population lived and died under conditions which violated all the now well known principles on which health depends; prejudice, ignorance, and vested interests stood in the way of progress, and but little effort was made to correct the one or remove the others; government looked on with indifference; the people knew little and thought less of the efficacy of pure air, pure water, cleanly and uncrowded dwellings, temperance, and other conditions which are now well known to be essential to health. They had no idea that infective disease is but too frequently the scourge of uncleanness, overcrowding, and disregard of simple laws of health.

Under the influence of such reformers as Chadwick, Parkes, Richardson, Simon, Southwood Smith, Sutherland, Bristow, Buchanan, Netten Radcliff, De Chaumont, Corfield, Thorne, Notter, Seaton, L. Parkes, Ballard, Power, A. Hill, Armstrong, Russell, Littlejohn, Cameron, Smith, Ransom, and others, to say nothing of Sanitary Engineers such as Rawlinson, Galton, Rogers Field, Hawkesley, Mansergh, etc., measures which were regarded as mere theories or fads of no practical value, are now accepted as of cardinal importance. Statesmen have learnt to realise that Sanitary Science comes well within the sphere of practical politics, and that it is an important part of the duty of executive governments, whether general or local, to protect the people from disease which may be prevented or controlled.

Numerous Acts of Parliament have been passed, such as the Public Health Act of 1875, Rivers Pollution Prevention Act 1876, Public Health (Water) Act 1878, Acts for Housing



the Working Classes 1885 and 1890, Infectious Diseases Notification Act 1889, Infectious Diseases Prevention Act 1890, Isolation Hospitals Act 1893, Public Health Act for London 1891, and many others. Officers of Health, Sanitary Engineers and Sanitary Inspectors have produced a better state of things; the poor are no longer left to be a law unto themselves on such matters. Public health is cared for in a sense which was utterly unknown in the past; houses are better built, sewerage, drainage and ventilation are provided for, the land is better cultivated, the subsoil better drained; the absolute importance of pure drinking-water is recognised, food is more varied and more nutritious in its character, clothing is better adapted to climate; and were all the existing official provisions enforced, little would remain to be desired on the part of the Executive government; but as some of these Acts are permissive, not compulsory, and as others are utterly neglected, much of the benefit they might confer is lost.

Though education has done much as far as the better classes are concerned, and upwards of 200 millions have been spent on sanitary work, with great benefit to the public health, popular teaching and example, and the general diffusion of education, are still necessary in order to convince the proletariat of what so intimately concerns their vital interests. The death-rate is susceptible of further diminution, expectancy of life may be enhanced, and the general conditions of living and exemption from certain forms of disease are by no means as perfect as they might be; tainted water is still drunk, as was illustrated by the condition of Maidstone and King's Lynn last year, where an extraordinary visitation of typhoid fever was traced to impure water, shewing either that legislation was imperfect or that its provisions had not been duly observed. Chimneys still vomit forth their smoke and chemical fumes, rivers are still polluted, cesspools and imperfect drains, badly constructed, ill-ventilated houses, and so on, still defy alike sanitary law and common sense; and it will perhaps not be until the more complete organisation of the public health administration under a Minister of Public Health be effected, that the full benefits of sanitary legislation will be realised and the people attain to that standard of health and duration of life for which they have a right to hope.

Even our great cities with all their improvements leave much to be desired. Notwithstanding Acts of Parliament, all the efforts of sanitary authorities, all the advice that may have issued from this and other similar sources, serious defects remain. Even your own great city, according to the journals, notwithstanding the splendid municipal arrangements for which

it is remarkable, has still a higher death-rate than some other great cities. Since 1882 up to 1897 it has stood at from 21·6 to 20·2, and the same authority points out sanitary defects which one may venture to think might be ameliorated.

In the first week of July in thirty-three of the largest English towns the rate of mortality, which had been 15·1 and 14·9 per thousand in the two preceding weeks, declined to 14·7. It was 14·3 in London, whilst it averaged 14·9 in the thirty-two provincial towns. The lowest death-rates were 9·4 in Cardiff, 9·7 in Huddersfield, 10·3 in Brighton. The highest rates were 17·9 in Plymouth, 20·3 in Newcastle, 21·4 in Sunderland. When the last quinquennium is compared with the preceding decennium it is found that Blackburn and Huddersfield have reduced their death-rate 4, Halifax and Cardiff 3·8, Oldham 3·7, Preston 3·4, Manchester 3·3 per thousand, while Birmingham has been practically at a stand-still.\* If I am not mistaken, your own eminent health officer thinks that if the death-rate is to be reduced, it is essential that the improvements should be continued which had such a good effect some years ago. I merely venture to suggest it as a hint that may be worthy of the consideration of the municipal authorities.

Apropos of London, Sir Henry Burdett said in a speech made last year: "London, unfortunately, in regard to certain health matters is still under the control of the Vestries. \* \* \* In the district of ——— for example, in this year of the Diamond Jubilee (wherein the greatness and majesty of the British Empire has been so convincingly exhibited,) the streets of one of the wealthiest portions of London are left unswept and uncared for from Saturday to Monday in each week. No matter how high the temperature, or how filthy the streets may be, the streets of probably the wealthiest district in the Metropolis of the Empire are made dangerous to health. \* \* \* \* Some of the most influential of the residents have entreated and protested in vain. The intelligent foreigner, to his surprise and disgust, may see in the streets of ——— on any Sunday when the principal residents are at home all day, fermenting filth and even dead cats, dirty papers and various kinds of offal, which offend the senses and infect the atmosphere to the danger of the inhabitants. Such a state of affairs is as shameful as it is unaccountable."

He might have added a paragraph upon the abominable and insanitary practice of sending out the vestry dust-carts to take away the house refuse at all times of the day. This

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\* "Lancet," July 16th, 1898.

proceeding is not only offensive to the eye and nose, but prejudicial to health. It ought to be promptly discontinued, and on no pretext ought dust-carts to be allowed in the streets after an early hour in the morning. Recent discussions in the House of Commons shew that the question of pure water supply also has not yet been satisfactorily settled or brought under the control of the sanitary authorities. It is to be hoped that disputes upon a question of such vital importance will not long remain unsettled.

Nevertheless, when we contrast the present state of our country with its 29 millions of inhabitants, with that of the Elizabethan era with its 4 millions, we have ample proof of the ignorance of science in those days and of the great improvements which have taken place in these. When we think of the ill-ventilated dwellings, the ill-built towns and villages, the narrow, unpaved, unlighted streets, uncultivated, marshy country, unreclaimed land, the wretched houses, often of wood or earth, without drainage or ventilation, with floors covered with straw or rushes saturated with filth and reeking with noxious miasmata, the stagnant gullies and open cesspools, to which must be added the wretched diet, often of salted meat, with little or no vegetable food, the intemperate habits, and frequently the most impure water, we can understand how under such conditions disease found a congenial nidus, and frequently assumed the epidemic proportions in which it proved so destructive to life, manifesting itself in the forms of the black death, sweating sickness, typhus, plague, eruptive fevers, small-pox, leprosy, scurvy, malarial fevers, and dysentery. Many of these have disappeared—never, we hope, to return—and others have been mitigated.

But can we feel confident that the immunity will continue? I am afraid not! Sudden invasions of cholera and other epidemics, and, as now, of plague in India, are warnings that our vigilance must never be relaxed. But the experience of our country under the greatly improved sanitary administration of the present time has shewn how much we may rely on preventive measures wisely enforced, especially when these are based on experience and enlightened observation, and not upon mere theories of causation.

A brief enquiry into the statistics of some well known diseases will show that they have become less severe in their incidence if not less frequent in their recurrence, and how far they are thus subject to the influence of hygienic measures.

In Small-pox, for example, there has been great reduction, more so than in any other disease. Since the passing of the first Vaccination Act in 1841, the death-rate has fallen from 576 per

million to 20 per million in 1891-95. Vaccination, isolation, attention to rational treatment, whether therapeutic or hygienic, have preceded or accompanied, and as most people believe, induced these results; and theories which ignore vaccination as a preventive must, it appears to me, necessarily be rejected until a better explanation of the cause of the diminished incidence and mortality from the disease can be offered.

As to the value of vaccination, all the evidence that is forthcoming seems to shew that there can be no doubt of it. As to the methods by which every individual is to be vaccinated or re-vaccinated, that is a subject for the State to determine. That the Acts in existence up to the present time are inadequate to this end is plainly shewn by the fact that large and increasing numbers of the population are known to be unvaccinated, despite their compulsory character. Lord Lister said in his speech in the House of Lords last August that one-third of the children born are unvaccinated, and that one-fourth of the Boards of Guardians do not put the law in force.

The most recent Vaccination Act, whatever may be its advantages, is certainly defective in this: that it makes no provision for re-vaccination, the necessity for which is universally admitted by the medical profession, whilst it is very doubtful whether the modification of the compulsory clauses will have the effect, as it is hoped, of extending vaccination. This remains to be seen during the five years for which the new Act is to be operative. Whatever the Government may have thought proper to enact, though there seems good reason to believe that as far as it is concerned faith in vaccination is unshaken, it must be borne in mind that the Royal College of Physicians have recently expressed their unaltered conviction, and it is endorsed by the whole profession, that vaccination "properly performed" and "duly repeated" is the only known preventive of small-pox, a view "which is confirmed by the experience of every epidemic, and is endorsed by those whose office it is to combat such outbreaks by all the resources of science. The characters of small-pox, its high degree of contagiousness, the rapidity of its spread on congenial soil, defy the efforts to suppress it by isolation alone or to arrest it in its earlier days of invasion, and if vaccination were not at hand to render its remarkable aid, the disease would become as common and as widespread in this country as it was in times when sanitary science was unknown." \*

In 1838 the death-rate from fever at all ages was 1,053 per million; in 1891-95 it was 185 per million. It was not until

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\* "Lancet," August 6th, 1898.

1869 that enteric fever was separated from typhus, so that it is not possible to say how much of the reduction should be assigned to each, but the death-rate from enteric fever has been reduced by about 53 per cent. since the diseases have been differentiated, whilst typhus has almost ceased to exist. Now these fevers notably flourish where sanitation is defective, and as dirt, overcrowding and destitution have been diminished so has typhus disappeared, whilst with improved drainage, the removal of excretal filth, and the supply of pure water, enteric fever has become less.

There is reason to think that Cholera is similarly influenced, for though it has appeared in England several times since its first invasion in 1831, as in 1845-49, '53-54, '65-66, and even since as at Grimsby in 1893, yet its virulence and activity have been gradually diminishing. I believe we do not know all the conditions on which the origin and diffusion of cholera depend, but it has been shewn here, as in India, that whatever may be its ultimate cause it is amenable to sanitary laws; and that though we may not be able to prevent it altogether, we can so mitigate its incidence and severity as to deprive it of much of its terrors. Happily the antiquated system of prevention by coercion has in our country been replaced by that of sanitary measures and isolation, and it is to the wise and judicious exercise of these by the medical authorities of our Local Government Board and County Councils, and by Municipal authorities and Health Officers throughout the kingdom, that whilst neighbouring countries in the full practice of coercion and quarantine were decimated, England has lately remained almost exempt. It seems to me that few better examples of the benefit arising from vigorous action by Government, under the guidance of scientific authority, could be adduced.

Scarlet fever and diphtheria were formerly tabulated together; since 1859 they have been separately returned, and I learn from Dr. Louis Parkes (a most worthy successor of his distinguished relative and namesake) that "in 1838-42 the joint mortality was 797 per million living; in 1891-95 it was 435 per million, a reduction of 45 per cent. Since 1861-65 the scarlet fever death-rate has been reduced 81 per cent., but the diphtheria death-rate is now very much the same as it was over thirty years ago (1861-65), and about double the rate prevailing in the fifteen years 1866-80. Whilst there can be little doubt that improved sanitary and social conditions have played some part in the reduction of the scarlet fever death-rate, still the larger proportion of the diminished mortality is probably attributable to a change in the type of the disease."

With regard to diphtheria, it would seem "that sanitary

arrangements as such have had little or no effect upon the behaviour of the disease. The exciting cause is now known to be a bacillus, but we know little of the conditions—the predisposing causes—which favour the growth or virulence of this micro-organism, either inside or outside the human body, or which facilitate its transference from the sick to the healthy—conditions which must be studied if we are to ascertain why it is that diphtheria has made certain large centres of population its abiding place, and in its endemic homes assumes at times epidemic proportions. There is evidently some connection between elementary school attendance as now carried out and diphtheria prevalence, but the relation is not a very simple one, and is incapable of explaining all the facts of increased diphtheria incidence in rural populations.”

Dr. Louis Parkes' remark suggests the necessity for studying all collateral conditions of other diseases as well as diphtheria, as being of equal importance with the microbe, which is believed to be the *causa causans*, and of more practical value as far as preventive measures are concerned.

In 1835-42 the death-rate from tuberculous disease was 3,959 per million, in 1891-95 it was 2,124, not so remarkable a diminution as in other diseases; but it serves to shew that sanitation has done good by helping to improve the ill-ventilated crowded dwellings, damp, waterlogged soil, impure water, and protection against noxious trades. Better drainage and drying of the subsoil have been shown by Sir G. Buchanan in this country, and Dr. Bowditch in America, to have been attended by diminution in the death-rate from this cause.

Dr. James Pollock, in a recent Report on the Hospital Treatment of Consumption, makes the following pertinent remarks: “In seeking for the cause of this vast improvement in the health of the country, we must attribute it mainly to improved drainage of the subsoil, more cleanly habits, removal of insanitary surroundings, better dwellings, and a higher standard of comfort in the lower classes. Bacteriology is the study of the hour, but it is plain that the presence of bacilli alone is not sufficient to account for all the phenomena of tubercular affections, and we are perhaps in danger of substituting the work of the laboratory and the microscope for clinical observation. However this may be, we have witnessed an enormous decrease of deaths from phthisis, and a decided lengthening of its duration. Fewer die of it, and are slower to die when affected. As yet we know of no agents which we can apply locally to the interior of the body for the destruction of bacilli or septic material. The energies of medical men are to-day devoted to preventive medicine, and in this consists our hope that the more

fatal diseases of our time may be extinguished." It is satisfactory to know that an Association has already been formed which has for its object the Prevention of Consumption and other forms of Tuberculosis, and as this is supported by the heads of the medical profession and other influential authorities, it is to be hoped that effective war will be waged against what is now considered to be a preventible disease.

As to malarial diseases, we may include them, in England at least, among those that have become all but extinct. The improved state of land drainage, the reclamation of marshy and swampy ground and more extensive cultivation have almost, though not altogether, eradicated a prolific source of disease and death which, though much diminished even in the early part of this century, had in past times caused the loss of many lives and great deterioration of health.

This disease is still the prominent cause of death in our Eastern Empire, as will be shown later; but the results of improved sanitation and the extension of cultivation and subsoil drainage, under the direction of the admirably conducted sanitary department of the Government of India, are there too producing good results.

It is not to be supposed that zymotic disease can be altogether exterminated, but we can modify and diminish its incidence, and as our knowledge of the real causes and the concomitant conditions which foster its evolution extend, we may hope, at least, if not to extinguish, so to attenuate as to render it comparatively harmless, as, indeed, has been the case with more than one scourge of our race.

The scope and aim of Sanitary Science in its preventive aspects should not be limited to the consideration of zymotic and other acute diseases, but should extend to the results of abnormal social conditions arising out of the strain and struggle for existence, involving over-competition in various occupations by which life is supported, or wealth and distinction acquired, and under the pressure of which so many lose their health or even succumb. For example, it frequently suggests itself that the over-pressure now exerted on the younger of the rising generation may not only involve the risk of miscarriage of true education, but dangers against which it is as much the duty of preventive medicine to guard young people as it is to protect them from scarlatina, small-pox, measles, cholera, or any other disease.

Again, as regards the food of the people, how necessary it is to exercise control and supervision; and it is satisfactory to know that not only does science teach the recognition of improper food, but executive sanitary regulations endeavour to

protect them from the consumption of tuberculous or otherwise contaminated flesh or milk—which, unhappily, are far too common—oysters and shell-fish grown up under the influence of water polluted with sewage, etc., as effectively as it does or should do from impure water.

The influence exerted on vital statistics by sanitary science may be seen by reference to the returns of the Registrar-General.

In the birth-rate, however, we find a diminution, especially since 1871–80, when it fell 3 per thousand. It has fluctuated from time to time, but since 1876—when it was 36·3 per thousand, the highest recorded—it has steadily declined, and for the quinquennium 1891–95 was 30·5 per thousand. This must be due to a variety of social conditions, which need not be discussed here.

The great increase in the population is an indication of the increasing prosperity of the country. This, of course, is attributable to many causes apart from sanitation, though, no doubt, improved hygienic conditions have some share in it, as is shewn by the diminished death-rate. The census of 1841 returned the population of England and Wales as 16,049,554, that of 1891 as 29,002,525, and it is still progressing at a similar rate,\* and not likely to be restricted whilst the present state of prosperity continues, and the Empire is ever enlarging its boundaries.

One indication of the effect of sanitary work is observed in the death-rate of the country. In 1841–50 it stood at 22·4 per thousand; in 1891–95 at 18·7 per thousand; but for the four years 1890–1893, it had risen owing to epidemic influenza, the lowest rate, 1884, having been 16·6 per thousand. It varies considerably according to locality. In some parts of England where health is the main object considered, it has been as low as 9 per thousand; in others where the chief objects are manufacture, trade, or money-making, it has been 30 per thousand. The death-rate is susceptible of considerable modification, and we know how it may be increased or diminished; it behoves the nation to exert its power and stand credited with the lowest figure. In fact, it is, within certain limits, at our own control, and whether the people shall die at the rate of 13 or 23 per thousand depends on how we recognise our responsibility and put in force sanitary regulations. It is mainly a question of finance. Our sanitarians can say how it is to be done and are perpetually saying it, but more money, more faith, more energy are needed to deal with this question satisfactorily.

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\* In the Registrar-General's quarterly return for the second quarter of 1898 it estimated at 31,397,078.



The death-rate has fallen proportionately more in the towns than among the rural population. In 1861-70 the town death-rate was 24·8 per thousand whilst the country was 19·7, but in 1891-95 the town rate was 19·5 and the country 17·3—in both cases a diminution but more marked in the urban, probably because sanitation was better in the towns than in the country.

There is a leading article in the *Standard* of June 23rd stating that the death-rate for London, one of the healthiest cities in the world, for the previous week had been 13·8 per thousand, the lowest for five years with the exception of one week in July last year, when it was 13·5. This shows that improvement has taken place of late years, for in 1855 it was 24·3 per thousand, in 1887 it was 19·3, and two years later it was 17·3.

The tendency to migrate to towns no doubt helps to reduce the general health, and it would be well to discourage this as much as social and economic requirements will permit; for a strong and healthy peasantry is more conducive to the national welfare than a weakly urban population.

The registration system came into force the year of the Queen's accession under the auspices of Dr. Farr, and it is since then that we have been able to get accurate vital statistics, upon which depends our knowledge of the state of public health, and from which also we can estimate the mean expectation of life. Statistics show that in 1838 to 1854 the mean expectation of life was for males 39·81, for females 41·85 years. From 1871-80 it had increased to 41·35 for males, 44·66 for females. "When Dr. Farr commenced his labours the mean duration of life in Surrey was 45 years. It was not more than 37 years in the Metropolis and 26 years in Liverpool. Now, the mean duration of life throughout the whole of England and Wales is higher than the first named figures."\* Dr. Tatham, in the Registrar-General's report for the last ten years, gives the mean expectation of life for males as 43·7, females 47·2 years. From a comparison of the tables of 1841 and 1881-90, it will be seen that this has increased both for males and females up to the age of 30, but diminished after that age.

Age.	1841.	1881-90.	1841.	1881-90.
20	39·88	40·27	40·81	42·44
30	33·13	32·52	34·25	34·76
40	26·56	25·42	27·72	27·60
50	20·02	18·52	21·07	20·56

\* "Practitioner," June, 1897, p. 704.

shewing that though improved sanitation saves more children's lives, the conditions of life being harder as time progresses, the expectation of adult life has become rather less: for the very causes which enabled the weak and sickly to survive have perhaps in the end thus tended to diminish the value of the adult life of such survivors.

It has been suggested that whilst our improved sanitation, our amended condition of living, and our more extended charity have done all this good, and have generally bettered the human race, on the other hand they have prolonged the existence of those who formerly would have succumbed rather than promoted the survival of the fittest. To a certain extent it may be so, but the moral sense insists that the benefit of our knowledge must continue to be exerted in the direction of ameliorating the sufferings, and prolonging the life of the individual as well as of the race.

As to the registration of sickness, to quote Dr. Farr:—"It is true that notification of the chief infective diseases has been secured in the majority of districts; but the wider returns of all sickness treated at the public expense, whether in rate-supported or State-supported institutions, or in hospitals supported by charity, are still left almost completely un-utilised. As Farr said, 'the thing to aim at ultimately is a return of cases of sickness in the civil population as complete as is now procured for the army in England.' By means of such returns 'illusion will be dispelled, quackery as completely as astrology suppressed, a science of therapeutics created, suffering diminished, life shielded from many dangers. The national returns of cases and of causes of death will be an arsenal which the genius of English healers cannot fail to turn to account.'"\*

I have already alluded to the benefits that have accrued to the vast population, over 280 millions, of our great Indian Empire, and I trust that a few remarks on the subject may not be considered inopportune. My former connection with India, and the experience derived from observation of its diseases and their effects, in addition to the interest that attaches to whatever concerns the health and well-being of our own as well as the indigenous races, will I trust be accepted as justification for introducing this into an address to a Congress that deals with public health as its chief topic of interest.

The beneficial results of sanitary work have nowhere been better illustrated during the last half-century than in India. Up to that time little or nothing had been done to control disease, or to organise measures upon which public health and

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\* "British Medical Journal," June 19th, 1897.

the preservation of life depend. The disastrous effects of the want of such precautionary measures on our Army in the Crimea led to the appointment of a Royal Commission to enquire into the sanitary condition of the British Army, and to devise measures for remedying such defects as might be revealed. And here I may say that the result of that Commission was that the mortality of the British Army has fallen from 16 or 18 to 6 or less per thousand. In 1859 this enquiry was extended to India; first to the European and subsequently to the Native Army and jail and civil population. The enquiry having to deal with a large body of men the conditions of whose lives were well known, a vast amount of reliable information was obtained; and it was ascertained as one result of the investigation that the ordinary death-rate of the British soldier had stood for a long period of time at the appalling figure of

84·6 per 1000 from 1800—1830  
56·70     "             "     1830—1856.

It resulted in certain sanitary changes and improvements in the housing, clothing, food, occupation and discipline of the soldiers, which were followed by a signal decline in the death-rate, though marked by fluctuations:—

1886	...	15·8	per 1000		1891	...	15·89	per 1000
1887	...	14·20	„		1892	...	17·07	„
1888	...	14·84	„		1893	...	12·61	„
1889	...	16·60	„		1894	...	16·07	„
1890	.	13·54	„		1895	...	15·26	„

It has been even lower, down to 10 per thousand. Epidemics such as fever, cholera, &c., disturb the regularity of the death-rate, but it is certain that on the whole there has been great reduction of this.

If we roughly estimate the value of a British soldier as £100, a simple calculation will show the amount of gain in the value of lives saved, to say nothing of the suffering and invaliding avoided.

I confine myself here to a simple reference to one form of preventible disease which has recently attracted much public notice, as it seriously menaced the efficiency of the army in India. Its rapid increase was attributed, erroneously, I believe, to the suppression of a Contagious Diseases Act which could only from the nature of things have been of very limited application in that country. But even granting that it may have been to a certain extent concerned, the main causes are to be sought far more probably in the absence of other preventive measures rather within the sphere of military discipline

As attention has been directed to this, as well as to other possible causes, it is to be hoped that the evil may be controlled.

The death-rate of the Native Army does not shew so great a diminution, but here too there is improvement.

In 1889	the death-rate	was	12·94	per thousand.
„ 1890	„	„	15·91	„
„ 1891	„	„	15·44	„
„ 1892	„	„	14·97	„
„ 1893	„	„	10·29	„
„ 1894	„	„	10·76	„
„ 1895	„	„	11·60	„

Another class about which we have reliable statistics is the jail population, and here the mortality is higher, despite sanitary measures. For example—

In 1889	it was	36·56	per thousand.
„ 1890	„	31·49	„
„ 1891	„	31·89	„
„ 1892	„	36·83	„
„ 1893	„	25·01	„
„ 1894	„	31·87	„
„ 1895	„	27·61	„

The high rate of sickness and mortality in the Indian jails has been a subject of anxious consideration to the Government of India and the sanitary authorities. No pains—I may say no expense—are spared in dealing with it. The abnormal conditions of prison life, and perhaps occasional defects in architectural construction, may in some measure account for it, and the probability is that were not every sanitary precaution rigidly enforced the mortality would be higher than it is.

As regards the vast civil population we have not only got to deal with epidemics, famine and long established modes of living, which obstruct improvement, but also with ignorance, prejudice and religious scruples, which tend to make the natives doggedly resist all measures taken for the amelioration of their condition. They persist in their ancestral modes of social life, resist all changes, and, as we have lately seen, have risen in revolt against the well-meant measures devised by authority for saving them from plague, cholera, and other pestilence. Their indolent habits, prejudiced minds and fatalistic creed all stand in the way, but even the natives of India are being gradually educated into a better comprehension of the value of sanitary measures, and, as time progresses, it is to be hoped that under the firm and judicious administration of the authorities, sanitation may prove as beneficial to them as it has been to others. Though we know that improvement is in progress it is not so easy to shew

by statistics the actual rates of mortality of the vast civil population, because so many disturbing causes exist; and though registration is greatly improved there is not the accuracy and reliability that belong to the returns of the army and jail population, which are all under supervision and control.

Referring to the published mortality returns during the period between 1882 and 1895, they have oscillated between 23 and 33 per thousand. This is after all not a very high death-rate considering the circumstances, but is susceptible of diminution, and this I trust will take place.

Since 1866 a well-organised sanitary department has existed and every effort is made to give effect to its teaching, whilst the ample and carefully constructed reports by the Chief Commissioner, as well as those of subordinate local governments and municipalities, afford ample data upon which to construct preventive measures, and at the same time shew that public health forms one of the most important considerations of the Government.

The annual Report of the Sanitary Commissioner with the Government of India for 1892 shews that out of a registered population of 217,255,655, 4,621,583 died of fevers. Compare this with the year 1895, when out of a registered population of 226,010,428 (note the increase) there was a death-rate from fevers of 4,266,293. These returns fluctuate, but at any rate the figures shew a tendency towards improvement. How much more fatal, fever is than any other disease is shewn by the following figures for 1892:—

Fevers caused	...	...	4,621,583 deaths.
Cholera „	...	...	727,493 „
Dysentery and diarrhœa caused			234,370 „
Small-pox		„	101,121 „

The plague which has appeared in India within the last two years, and has so largely added to the death-rate in certain localities, its modes of invasion, diffusion, and recrudescence, are all being carefully studied, and already it has been shewn to be amenable to sanitary laws like other epidemics; we may, therefore, hope to ultimately control and get rid of it altogether, though there is reason to fear that this will not take place for some time to come.

It is satisfactory to know that the etiology of cholera, plague, and fevers is being carefully investigated by competent observers, and we are warranted in believing that we are approaching the solution of important problems of ultimate causation of disease which have hitherto remained without satisfactory explanation, and the knowledge of which will enable

us to construct our measures for prevention upon an even more assured basis than they occupy at present.

In connection with the subject of sanitation and preventive medicine in India, one may not omit to refer to the names of its great pioneers, such as Ainsley, who wrote as early as 1788 upon measures for the protection of the health of soldiers; Ranald Martin, who was one of the foremost pioneers in India as he was in this country, and to whose initiation many of the sanitary measures now in force in both countries are due; later on J. M. Cuninghame, Bryden, Cornish, Hewlett, Ewart, D. Cunningham, Vandyke Carter, Simpson, Manson (China), whose investigations into the causation of malarial fevers have justly excited so much attention; and to these, did time permit, I might add a number of names of younger men to whose admirable work I gladly bear testimony.

I have already noticed the great progress that has been made of late years in the knowledge of the etiology of disease. This is not the time or place in which to describe or dilate on the various steps by which it has been or is being acquired; but one must not omit to acknowledge that its importance in relation to hygiene and as a scientific basis on which to found any rational system of proceeding with regard to prevention as well as cure of disease is incalculable, for without it, although empirical methods may be of some value, no real progress can be maintained.

It is impossible to exaggerate the value of these researches, which have already led to the antiseptic methods of preventing the noxious action of micro-organisms and their products, and to the knowledge of the immunising or curative effects produced by inoculation of the attenuated virus, toxins or antitoxins (blood serum therapeutics), as well as to the aid that has been afforded to diagnosis. Already, indeed, important practical results have been obtained.

I am indebted to Dr. A. Macfadyen, the able Director of the Institute of Preventive Medicine, himself one of the most distinguished workers in bacteriology, for the following lucid account of the progress already made in the application of bacteriological science to the prevention and treatment of disease, and which holds out promise of further advance in this most important branch of science. The successful establishment of the Bacteriological Department of the Institute as well as of that of the Royal Colleges, is an earnest of further development in our own country of a branch of scientific enquiry which is obviously of such vital importance to public health and to those interests with which this Congress is so closely concerned.

“ There can be no better memorial to Jenner than to carry on his work in his spirit. The fresh impulse to this was derived from the labours of Pasteur and Koch, who not only demonstrated the part that living agents play in the causation of disease, but also gave us the methods whereby these might be investigated. In this way the foundations of bacteriology were laid.

The main problems connected with the causation and prevention of disease and many sanitary questions are bacteriological in their nature, whilst some of the most pressing questions connected with water and sewage are of a biological character. The soil, air, and water, as well as our food, have to be considered as possible media for harbouring and conveying the living germs of disease.

The question of questions has been that of immunity to disease. We know that animals are insusceptible to certain diseases that affect man, and that the converse holds good. We also know that certain individuals remain unaffected in times of epidemic, though equally exposed to the infection. Further, that recovery from certain diseases protects the individual against a subsequent attack of the same disease.

The attempt has been made to follow nature's methods in the hope of protecting the system from the attack of a disease or of alleviating its symptoms. The discovery of the principle of vaccination for small-pox remained a unique achievement until the successful isolation of the living agents in many infectious diseases rendered it possible to work with greater certainty of success in this field.

The attempt was made to use the modified living virus to produce a mild attack of a disease with a view of protecting the system against infection with the fully virulent virus, *e.g.*, Pasteur's attenuated anthrax vaccine for cattle.

The endeavour was also made to use as a vaccine, substances which no longer contained the living organisms, but their products. Bacterial toxins of varying origin have been experimented with for the purpose, *e.g.*, products obtained from the cultures or the bodies of pathogenic bacteria; as in the case of the cholera and typhoid fever organisms, and more recently the disintegrated bodies of tubercle bacilli.

The results are not yet of a final character, though much hopeful work is being done in connection with cholera asiatica, enteric fever and tuberculosis.

The greatest modern advance in the treatment of disease has been the introduction of serum therapeutics through Behring's labours, which have found their special application in connection with diphtheria and tetanus.

Diphtheria and tetanus may be described as toxic diseases, inasmuch as the general intoxication of the system due to the poisonous products of the diphtheria bacillus or the tetanus bacillus outweighs in gravity the local action of these organisms at the seat of infection. These bacilli when cultivated in suitable media produce the same toxins that they elaborate in the body, and it is these toxins which

are utilized for immunizing purposes. The animal used is usually the horse, which after treatment with progressively increasing doses of the toxin becomes ultimately insusceptible to otherwise fatal doses of these poisonous products. The animal is then said to be 'immune,' in virtue of antitoxic bodies produced in its system through the introduction of the toxins. The blood serum of the immunized animal contains the antitoxic bodies in large quantity, and can, when transferred to other susceptible animals, confer a like protection in virtue of the immunizing substances it contains. The method adopted is appropriately termed 'blood serum therapeutics.' This procedure is technically known as 'passive' immunity, *i.e.*, the animal has not to go through an attack of the specific disease in order to acquire protection.

The bodies that are produced in the course of immunizing a horse, say to diphtheria, are called antitoxins, because they act not so much on the specific microbe as on its products. In the course of an attack of such a disease the human body elaborates similar substances, which are in a certain sense antidotes. If formed in a sufficient quantity a neutralization of the toxins that are being formed by the microbe in the system occurs and recovery takes place. At the 'crisis' nature effects a process of self-immunization. In the older methods it was sought to produce immunity by inducing a mild attack of the disease. In the case of blood serum therapeutics, immunity is brought about by introducing into the system ready formed 'antitoxins' from a previously immunized animal, and the result, if successful, is an immediate one. The immunity is transient however, lasting only a few weeks.

The preparation of such antitoxic serums has only a prospect of success, when the poison to which the fatal effects of the illness are due is known, and can be obtained of an adequate strength for immunizing purposes. This has been the case in diphtheria, tetanus, and snake poisoning, and hence the most encouraging results that have been obtained are in connection with these complaints.

Experiment has shown that an antitoxin can act both as a preventive and curative agent. Thus, in the case of experimental tetanus, the serum from a previously immunized animal when injected into a guinea-pig is not only able to prevent the disease but also to cure it, even when tetanus symptoms have supervened.

It is in connection with diphtheria that the most successful results have been obtained in man. The Imperial Board of Health, Berlin, has published statistics in relation to diphtheria, which deal with 9,581 cases treated in hospitals with diphtheria serum from April, 1895, to March, 1896, and shew that for every 16 cases that recovered 3 died. In previous years before the serum was used there were on an average 6 deaths for every 16 recoveries. The mortality was accordingly reduced by one half.

The diphtheria serum has also preventive properties, and can be used for immunizing healthy persons exposed to infection.

In the case of tetanus in man the results have hitherto not been so satisfactory. This may be due to the fact that the serum has



not been of sufficient antitoxic strength, or because the disease was too far advanced previous to its employment.

In all cases the best results are obtained by the earliest possible use of the antitoxic serum.

The facts that seem proved are, that in human diseases characterised by an intoxication of the system, immunity occurs at the moment of recovery, and that by the artificial introduction of the substances to which this immunity is due it is possible to prevent or cure such infections.

If this be so the present endeavours of bacteriologists are based on Nature's methods, and we can confidently look forward to still greater achievements in the field of serum therapeutics.

Bacteriology has also supplied agents which are of proved value in the diagnosis of certain diseases. Thus *Mallein*, a preparation from the glanders bacillus, is successfully used for the early diagnosis of this disease. *Tuberculin*, a similar preparation from the tubercle bacillus, allows of an early diagnosis of the disease in cattle. An early diagnosis enables one to adopt timely preventive measures, and therein is the great value of tuberculin, inasmuch as we are here dealing with a communicable disease between man and animals.

Bacteriology has also rendered valuable help in the diagnosis of diphtheria and typhoid fever, and medical men and sanitary authorities are now largely availing themselves of this help.

The yearly increase in the work the British Institute of Preventive Medicine is asked to undertake on behalf of sanitary authorities demonstrates how keenly alive they are becoming to the importance of adopting the latest methods calculated to safeguard the health of the community."

Evidently, a great future is before preventive medicine, and we may confidently look to the eminent men of science who are now pursuing with such indefatigable zeal their researches into the mysteries of bacteriology for its fulfilment. But those who admire and appreciate their work the most, and look forward hopefully to its results are anxious that progress should not be retarded by hasty deduction and premature generalisation, which may only end in disappointment.

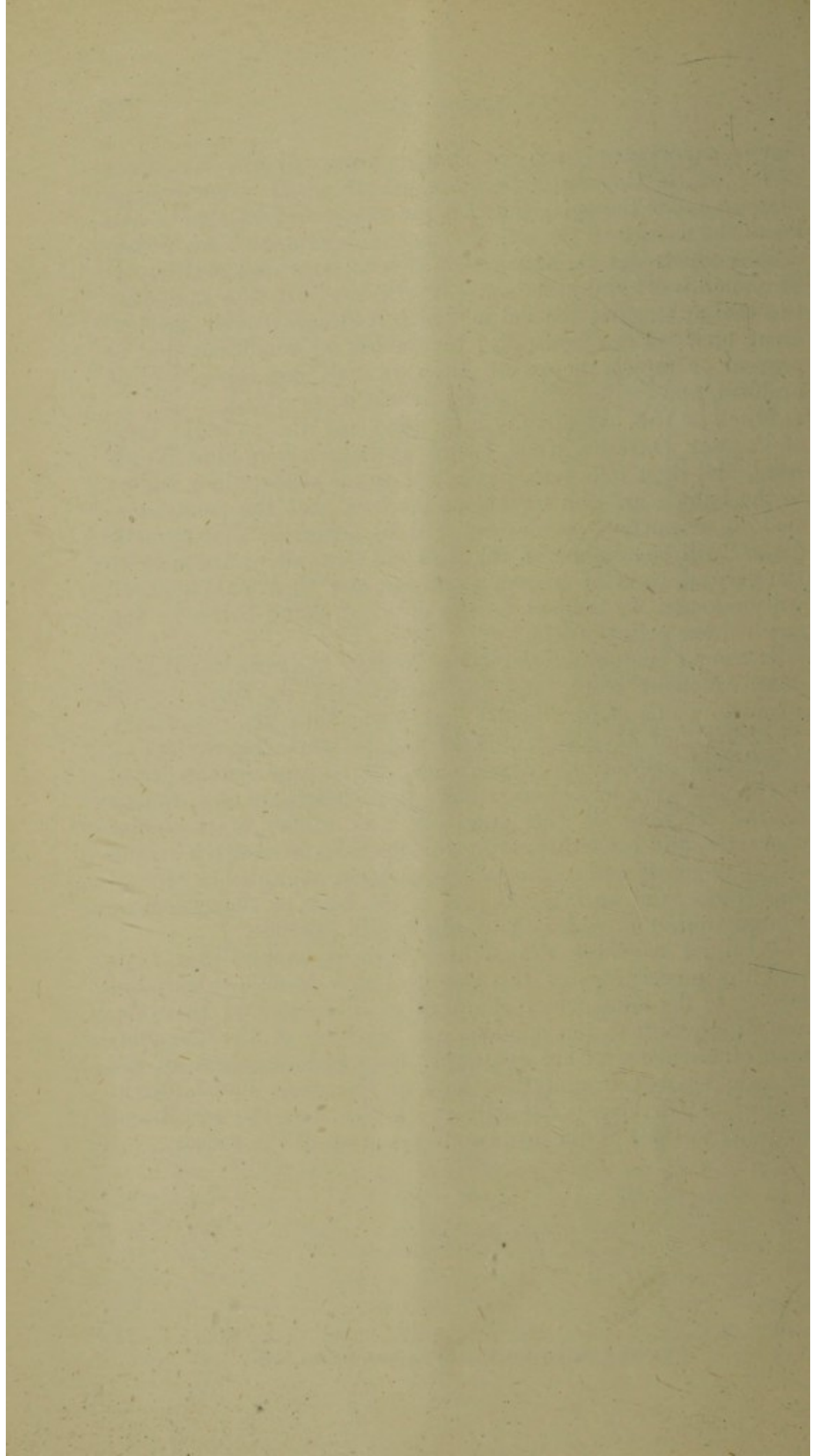
I venture to suggest that however great may be the importance of the study of bacteriology and the various conclusions resulting from it with regard to the origin, diffusion, and prevention of disease, there are other factors of no less importance to be considered, and it can only be by the study of all these that we can hope to arrive at the complete knowledge which will enable us to fulfil the requirements of sanitary science. Whilst on the one hand it is of the utmost significance that we should be able to demonstrate the actual cause, whether a micro-organism or not, on the other hand it is not of less—nay, from a practical sanitary point of view it is of

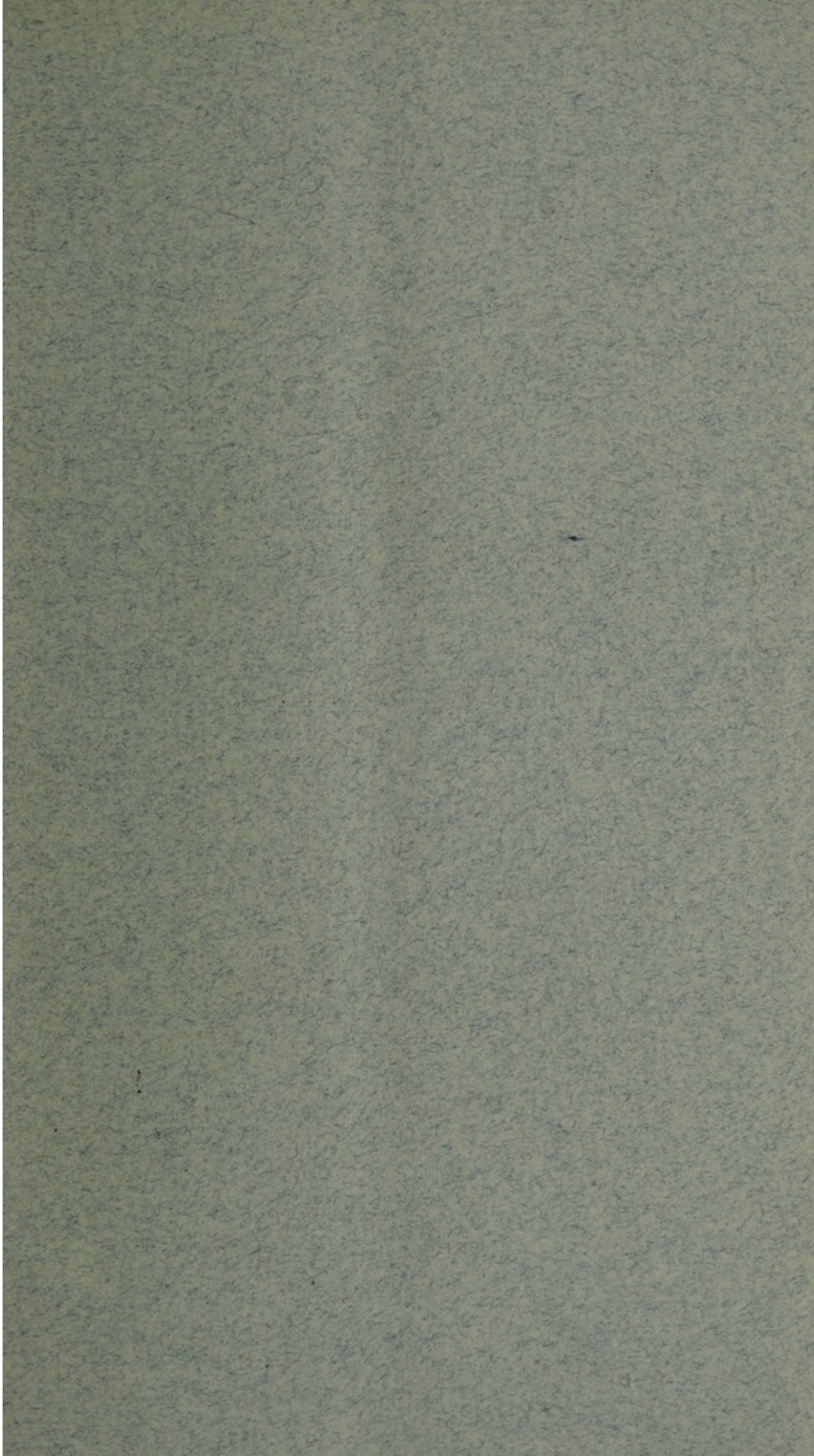
more—importance that we should know all the conditions under which this cause becomes effective. It is not enough that we know the seed, but it is necessary that we should also know the nature of the soil, the meteorological and other conditions which determine whether it is to grow and multiply or to remain inert and harmless. If one can learn how to destroy the seed or sterilize the soil in which it attains its full development, or if we can neutralise the favouring conditions and so prevent or impede its growth, then we shall have solved a great problem, and conferred a lasting benefit on mankind.

Much of this has already been done, and the splendid work of Pasteur, Davaine, Koch, Lister, B. Saunderson, Sims Woodhead, and their followers, has added and is almost daily adding to the knowledge which confirms the hope that the consummation so devoutly to be desired will be achieved, that zymotic disease will be minimised, that life will be prolonged nearer to the natural term of human existence, and that man, in short, will no longer be subject to the curse of dying before he has reached the prime of life.

It cannot be doubted that The Sanitary Institute has already done excellent work, and has contributed its share to the advance which public health has made since its foundation. The Spirit of Hygeia is abroad, and measures for preserving health and preventing disease, which at no very distant period in the past were looked on as mere hypotheses, are now, thanks to the teaching of this Institute and others of a similar character, and notwithstanding the obstacles to research arising out of ill-considered sentimental opposition, regarded as of vital importance, and an integral part of the basis of the system of administration on which the public health depends.

I cannot conclude this address without expressing a hope that the proceedings of this Congress now assembled may add largely to the influence of the work of The Sanitary Institute, and widely diffuse the opinions and teaching of the numerous men of science who are associated here and elsewhere in the crusade against insanitation, and in the great humanitarian project of furthering not only the health, but the moral and material welfare of our own country and of all the world.





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