The prevention of preventable disease : an address to the Glasgow Obstetrical & Gynaecological Society, delivered 24th May, 1893 / by Sir Spencer Wells.

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THE PREVENTION OF PREVENTABLE DISEASE:

An Address

TO THE

GLASGOW OBSTETRICAL & GYNÆCOLOGICAL SOCIETY,
DELIVERED 24th MAY, 1893,

BY

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THE

PREVENTION OF PREVENTABLE DISEASE.

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Mr. President and Gentlemen,—I need not say that an invitation to address a meeting of professional brethren in the commercial capital of Scotland—"in population the second city in Great Britain"—should be gratefully acknowledged by any one as a great honour. And when I learned that, although the Glasgow Obstetrical and Gynæcological Society was founded only eight years ago, it now numbers about 130 members (among whom are not only all the Glasgow gynæcologists, but also a large and constantly increasing number of general practitioners), I felt not only extremely grateful for the opportunity of addressing so many friends and colleagues, but also embarrassed by the difficulty of selecting some subject in which the members generally might be interested and, possibly, influenced for good. I first thought that some historical account of the more recent developments of abdominal surgery which followed the rise and progress of ovariotomy might be acceptable. But the fact that I had so recently devoted the Bradshaw lecture at the College of Surgeons to this subject, induced me to rather offer some published copies of this lecture for your acceptance, and ask you to read at your leisure what I said then and believe now, than to repeat here what I have already published. Copies are here on the table at the service of any one to whom they may be of use, and I will at once pass on to another subject which is not only interesting to operating surgeons, but to obstetricians and gynæcologists, who may be more usefully occupied in the consideration of some questions of preventive and curative medicine than of those surgical operations which are often performed by gynæcologists.

After carefully considering how I could most usefully occupy the time so kindly placed at my disposal by your

President, and possibly exert some influence for good upon those who do me the honour of attending here to-night, and upon other members of this Society, I remembered that, in the presidential address at the opening of the International Congress of Hygiene in London, the Prince of Wales asked, "Where could one find a family which has not, in some of its members, suffered from typhoid fever, or diphtheria, or other of those illnesses which are especially called 'preventable diseases?' where is there a family in which it might not be asked, 'If preventable, why not prevented?'" And reflecting that this Society is especially devoted to the study and practice of obstetrics and gynæcology, it occurred to me that of all the preventable diseases which may be, and ought to be, prevented, the disease commonly known as puerperal fever is of so much importance to you all, that I could not go very far wrong if I asked you to ask yourselves the question whether puerperal fever is a preventable disease or not, and if preventable, how it may be prevented.

The first question opens up the old controversy whether there is any such disease as a specific puerperal fever—a fever following upon childbirth which may differ from scarlet fever, or erysipelas, or measles, or diphtheria, attacking a woman in the peculiarly susceptible condition which accompanies or follows pregnancy, labour, and delivery—or whether puerperal fever may always be due to blood poisoning from the absorption of decomposing blood or other exudation imperfectly cleared away from the uterine cavity or the vagina, the absorption assisted by such mechanical injuries as abrasions or lacerations occurring during delivery—a fever which might be more correctly termed puerperal pyæmia or septicæmia—not due to the inoculation of any such definite morbid poison as the specific germs of any communicable disease. Or, to put the question in another way, if we are dealing with a pregnant and parturient woman who has been protected from, or not exposed to, the poison of erysipelas, scarlet fever, small-pox, or any such communicable fever, she may still have fallen a victim to a distinct morbid poison —to a microbe which may be recognised and cultivated, and inoculated, and which causes a definite train of symptoms characteristic of puerperal fever, and transmissable to other parturient women.

If we turn to the official reports of the Registrar-General in England, Scotland, or Ireland in hope of finding some assistance in clearing up any such doubt, we are still left in a state of uncertainty. For instance, in the last published annual report of the Registrar for England—that for 1891—

we read, "The deaths attributed to puerperal fever were 1,973, and if to these be added 2,814 other deaths from the various accidents of childbirth, we have a total of 4,787 deaths, giving a mortality of 5·24 to 1,000 registered births."

But we are left in doubt as to how far the deaths registered as from erysipelas, pyæmia, septicæmia, and puerperal fever have been accurately certified; and in what proportion others registered as premature births, puerperal mania, puerperal convulsions, placenta prævia, flooding, phlegmasia dolens, and other accidents of childbirth may or may not have been due to, or complicated by, puerperal fever. In the valuable table where the proportion of deaths to 1,000 births in the different registration counties of England is compared, "puerperal fever and accidents of childbirth" are grouped together. "Diseases of parturition" is another general heading which may include a variable proportion of cases of puerperal fever. The lesson from this is, that the registrars are dependent on the practitioners who give the certificates; and while more accurate certificates are undoubtedly required by all who desire to improve the national health and ascertain the true causes of disease, it should not be forgotten that the gentlemen who at present perform an important duty to the State have done so for many years past without acknowledgment or reward. This has been made known to the Select Committee of the House of Commons on Death Certification, which is still sitting, which your able and influential member, Dr. Cameron, succeeded in obtaining from the Government, and we may hope that when it becomes known how far accurate registration of the cause of death may lead towards a knowledge of the best and surest modes of preventing disease—of shortening sickness and prolonging life—such important service to the nation will be recognised and rewarded, either by the state or by some such local authority as a municipality or a County Council.

But however desirous anyone of us may be to fill up a death certificate accurately, it may be difficult in many cases to be sure whether puerperal fever, pyæmia, septicæmia, scarlatina, or some accident of childbirth would be the more correct return. Here, again, there crops up the old difficulty on which so many thousands of pages have been published. It is nearly twenty years since I raised a discussion at the Obstetrical Society of London "On the Relation of Puerperal Fever to the Infective Diseases and Pyæmia." A full report of my paper, and of the discussion to which it led, and was continued on four nights, may be found in the *Obstetrical Transactions for 1875.*

Puerperal fever, if we follow the nomenclature of diseases drawn up by our College of Physicians, is "a continued fever, communicable by contagion, occurring in connection with childbirth, and often associated with extensive local lesions, especially of the uterine system." Dr. Fordyce Barker, who crossed the Atlantic purposely to join in the discussion, accepted this definition as "absolutely correct," although its author, Dr. Arthur Farre, thought it might be modified by saying that the fever was "*often* communicable by contagion," implying that sometimes it was not. But however much we may discuss these problems, the main interest with us this afternoon is the question whether this fever is preventable, and how it may be prevented. And here we possess perhaps stronger and more extended evidence than can be procured respecting any other communicable fever. Dr. Duka's memoir of Semmelweis, and the history of his wonderful success in the prevention of childbed fever in Vienna, is one of the most effective chapters in medical history. In 1841 a terrible outbreak of childbed fever in the maternity department of the General Hospital of Vienna broke out and lasted for twenty months. Of more than 5,000 parturient women more than 800 died—a terrible mortality of more than 16 per cent. Then came a change. From 1841 to 1846, students and midwives worked in separate departments, and the fatality in the students' wards was 9, in the midwives' only 3 per cent. When Semmelweis was striving to discover the cause of this remarkable state of things, he became convinced that the death of a friend, who fell a victim to phlebitis and secondary abscesses after an operation wound, was exactly what he had so often noticed in fatal puerperal cases, and he reasoned that the cause in both cases was "poisoning by decomposed particles of a dead body." The dissecting students had been satisfied with washing their hands in soap and water, which was clearly insufficient to remove all particles of poisonous matter from the fingers and nails. Accordingly in May, 1847, Semmelweis ordered every student, before examining a pregnant woman, to thoroughly wash his hands with chlorinated lime water. At that time the percentage of mortality stood at 12 per cent. In six months it was reduced to 3. In the second year of the experiment the death-rate fell to 1·27 per cent. The practical outcome of the great work of Semmelweis' life is that puerperal fever can be prevented by "removal of maternity wards from insanitary surroundings, great care and gentleness in using instruments, scrupulous attention to general cleanliness, and frequent use of antiseptics." These are the words of Dr. Duka, to whom I am indebted for a few copies of his valuable memoir, which are here on the

table offered for your acceptance. I feel sure that any one who reads the memoir will agree that the memory of this man should be honoured, and that the international monument which it is proposed to erect in his native city, Buda Pesth, deserves the support of every philanthropist.

It would be easy to quote many other published statements to prove how puerperal fever has been almost abolished, both in hospital and private practice, by aseptic and antiseptic precautions and treatment. And whatever share some may believe that scarlet fever, or erysipelas, or any other poison may have as its cause, the main argument is that it is preventable and ought to be prevented. Only last week I received from Dr. Vincent, of Lyons, some important information as to the mortality in the maternity of that city before and after the introduction of the antiseptics there. I am unwilling to trouble you with many figures, but I may briefly say that in the eight years before 1878, the deaths varied from 79, 56, 50, 42 to the lowest 21 per 1,000. In the following six years to 1883, when carbolic acid was the antiseptic used, the mortality fell from 16 down to 9 per 1,000, and after 1884, when bichloride of mercury was substituted for carbolic acid, the mortality has gradually fallen, until it is now less than 1 in 1,000, in 1887 only one death having occurred among 1,231 births. Using the perchloride solution of the strength only 1 to 2 to 4,000, no harm has, in any case, been traced to the mercury. On going over your own Maternity this morning with Dr. Murdoch Cameron, I was delighted to find that puerperal fever has been so rare during the past few years, that it is almost disregarded. In former years, before the antiseptic age, the mortality was so great that the Hospital had to be closed several times.

Next, the question arises whether there may not be a safer, better, and less objectionable antiseptic in midwifery practice than either carbolic acid or perchloride of mercury. M. Pasteur himself has assisted in this enquiry. His observations of pus taken from the peritoneal cavity and of blood from the veins of women during the progress of fatal puerperal fever, lead him to the conclusion that a tepid saturated solution of boracic acid would *prevent* an attack of puerperal fever in any woman who had not some abscess before labour. He would keep such a solution near the bed during labour, and use compresses, sterilised by heat and wetted with this solution, frequently applied. It is reported very confidently that in several French maternities, where this antiseptic has been properly used, puerperal fever has almost disappeared.

But whether some cling to carbolic acid, others to perchloride of mercury, some to sulphurous acid, some to permanganate of potash—holding to that which they believe to be and have found to be good—whether others follow Pasteur and prefer boracic acid, or are perhaps impressed by still more recent observations, and adopt the oldest and cheapest and most universally obtainable of all antiseptics, common salt, in weak solution, all must agree that the antiseptic should be efficiently used; and as knowledge increases we shall probably learn to vary the antiseptic with the microbe we have to destroy. Many years ago I asked M. Pasteur which he thought would be the best general disinfectant. He replied that this must depend upon the disease, and gave me a practical hint which I have many times found of great value at the bedside. He spoke of a very common form of catarrh of the bladder with viscid mucus and ammoniacal urine, due to the action of a well-defined vibrio which resists washing out of the bladder with water which has been simply sterilised by boiling, or charged with any acid or germicide as strongly as can be safely used, but which is in a very few hours destroyed by a saturated solution of boracic acid. I have proved the truth of this to my great satisfaction and rapid relief of the patient in many cases. Here permit me to read what my friend Dr. Ruffer has published on this very important practical matter. He says—"To limit the spread of infectious disease it is necessary that we should have full and accurate knowledge of the disinfecting power of every disinfecting agent on every micro-organism. How, for instance, are we to stop the spread of phthisis if we do not know what strength of disinfecting fluid will kill the specific bacillus? How are we to arrest the spread of typhoid if we do not know how much sublimate or other disinfecting agent will kill the bacillus of typhoid? It is a far more complicated business than most people think, or have any idea of. Like most people, I have been unfortunate enough to see many of my friends die of phthisis, which, in some cases, was contracted from their nearest and dearest relations, and I have often been struck with the astonishing ignorance, not only of the public, but of the medical profession, as to what constitutes a disinfectant. I have seen cases of phthisis in which the patient was never taught once from beginning to end that it was his duty to expectorate into antiseptics only. I have seen other cases in which the antiseptics, such as sanitas or weak Condy's fluid, were worse than useless, for they gave the friends and the patient an idea of security where none exists. Similarly, in typhoid, I have seen physicians

recommend the mixing of the typhoid dejecta, with such powerless agents as Condy's fluid or utterly inefficient doses of sublimate. In other cases I have seen them mix them with 5 per cent carbolic acid, forgetting (or not knowing rather) that carbolic acid has been found to be almost powerless on the typhoid bacillus, so that it is used in the laboratory for the isolation of that bacillus from other bacteria which may be present in the fluid. We must remember that every disinfectant will not act in the same dose on every organism—that arsenic is a poison, for instance, and yet some moulds will live in a solution of arsenic, and although this fact at first appears to make the task a more difficult and complicated one, yet it opens up the hope that a substance may be found for each micro-organism, which may prove fatal in small doses to that microbe, without producing any symptoms in the patient."

Surely there is good and sufficient reason to hope that by aseptic and antiseptic treatment carefully carried out under intelligent superintendence, puerperal fever may almost always be prevented, and that when a rare exceptional case appears it may be traced to some accidental imperfection in the use of the preventive safeguard. And we may further confidently trust that, when the teachings of science are generally known and obeyed, puerperal fever will be abolished, and the deaths of some two or three thousand women in every year in England and Wales, or say of about 1 in every 150 in the whole kingdom, who now die within a month after childbirth, will no longer be regarded as unavoidable, or deplored as providential, but rather used as stimulants to stronger exertions and to more firm determination of every one of us to prevent preventable disease to the very utmost of our power.

It would be easy to multiply proofs by the results of experience of lying-in-hospitals here, at home, and in America, supporting that of Germany and France, and encouraging us to work on hopefully; but time is short, and I must pass on to other, perhaps less familiar, investigations, and more recent researches. We have passed the time when bacteriology was in its infancy. It may not yet have reached beyond the stage of early childhood or adolescence; but it has advanced far enough to add a great deal to the knowledge of 1875. The term "septic poison" was used by several speakers in the discussion at the Obstetrical Society, but what they meant is not clear. Certainly not any such mineral or chemical poison as arsenic or strychnia; probably not any such poisonous gas as sulphuretted or phosphuretted hydrogen; perhaps not anything absorbed from dead or decomposing

matter. It is only exceptionally that a living poison seems to have been considered—a germ or seed which, sown on a fruitful soil, and under favouring conditions of moisture and temperature, may "bear fruit a hundredfold." At that time professional opinion had not been much influenced by the lessons which the physiologist had learned by inoculations and the cultivation of microbes. The destruction of poisonous germs, or their preservation and retention of latent life for many years; their occasional reproduction and multiplication with amazing rapidity, each producing its kind—small-pox, cholera, typhoid, diphtheria, tubercle—reproducing itself as certainly as wheat, barley, or oats, the fig, or the thistle. The radiation of Pasteur's light had not penetrated very far or very deeply. It was not for some years afterwards that various kinds of micro-organisms were recognised, and even now the true pathogenic importance of some is arguable, and quite open to difference of opinion. Take, for instance, the streptococcus pyogenes. Some believe that this microbe and the streptococcus erysipelatosus are identical, are precisely the same organism—one not distinguishable from the other. Some careful observers have arrived at the conclusion that although very little is really known on the subject, yet that in all cases of puerperal infective disease the streptococcus pyogenes is always present, while no micro-organisms are to be found in the lochia of perfectly healthy women after confinement, nor any pyogenic organisms in the vagina of women who have never used injections nor have been submitted to digital examinations; whereas, in all cases of perimetritis and puerperal peritonitis the streptococcus pyogenes may be found, and sometimes staphylococci also.

It has also been shown that while there is a stage or period of disease when the streptococcus is found alone, afterwards staphylococci are present as a secondary infection. The extreme danger of such purulent infection in childbirth has been shown by the facts that the death of several women has been distinctly traced to midwives, who have inoculated the microbes of purulent ophthalmia with a fatal result to one woman, and who have carried the poison and fever to a succession of other parturient women, who afterwards died of puerperal peritonitis, both streptococci and staphylococci having been found in the pus.

The study of the prevention of preventable diseases has been wonderfully assisted by the advance of bacteriology during the last twenty years. The evolution of physiological and pathological histology following microscopical observa-

tions of the tissues, and cells, and morbid growths, was the foundation of modern pathological anatomy. But it was not until Davaine, Chauveau, and Toussaint had led the way to the discoveries and teaching of Pasteur, that many of the diseases of man and the lower animals have become better understood, and their causes explained by the action of microbes or parasites (poisons not arising *within* our bodies, but introduced from without, parasites living in the air, in water, in the earth), which, recognised, cultivated outside the body, watched in the cellular changes each causes after introduction, in the poisons (so-called toxines) which they secrete before or engender after their death, and the vital reactions to which they give rise do not simply satisfy scientific curiosity, but at once lead to hygienic precautions, to preventive or attenuated vaccinations, and antiseptic treatment. Clinical observations have lately shown that, in man at least, the large majority, if not all, cases of inflammation and suppuration are due to the action of some micro-organism. Moreover, it would appear that one micro-organism will certainly produce suppuration, and that wherever there is suppuration after confinement, there is always the streptococcus pyogenes. Abscesses may be caused by the typhoid bacillus, by the micro-bacillus of pneumonia, and the bacillus coli-communis, just as much as by the micro-organisms which are more commonly recognised as the causative agents of suppuration—viz., the staphylococcus albus or aureus, or the streptococcus pyogenes.

Now, with regard to the latter class of micro-organisms, we know that they are always with us, that they may be found on the skin, in the mouth, the intestine. Nevertheless, they do not appear to thrive on any mucous membranes except on the intestinal. Experiments have shown that the respiratory passages, the trachea even, are practically free from bacteria. Similarly the uterine mucous membrane, and even the vagina, of healthy women appears to be free from micro-organisms, and this leads us to the first practical point of interest—namely, that infection of the uterus nearly always comes from without.

The finger of the midwife or the accoucheur must often be the contaminating agent, and we must remember that the non-asepticised finger is almost bound to carry in the germs of infection. Puerperal peritonitis, and the various inflammations which start from the uterus after labour, are nearly always due to the presence of the streptococcus pyogenes, associated or not with other micro-organisms, such as the staphylococcus albus or aureus. The introduction of the

midwife's finger may act in two ways—the finger may either introduce the streptococcus pyogenes, or it may introduce other micro-organisms which may favour the development of this streptococcus.

A few words of explanation are here necessary. Experimental observers have lately shown that a comparatively harmless microbe may be rendered exceedingly virulent if introduced into the system with another harmless microbe. Similarly a small quantity of a pathogenic bacillus (such as the bacillus of tetanus) will produce no effect unless it be introduced with some other microbe. A few examples will suffice. The *bacillus Chauvoei* is harmless to rabbits, but if this bacillus be injected with the micrococcus prodigiosus (which is in itself harmless) the rabbit invariably succumbs to the action of the first-named bacillus. A small quantity of the bacillus of tetanus produces no effect on a guinea-pig; but, if a small quantity of another harmless micro-organism, such as the bacillus proteus, be injected at the same time, the animal dies of tetanus. Moreover, it is not even necessary to inject the harmless microbe itself, for a small dose of its poisons will produce the same effect—it will give the more virulent microbe a chance of starting.

Applying this knowledge gained in the laboratory to the case of labour, we see that the introduction of micro-organisms, harmless themselves, is a danger. Even if the streptococcus pyogenes has not already invaded the uterus, the presence of another micro-organism will favour its development, should it find its way in at some future time. Or should the streptococcus pyogenes be already present in doses not sufficient to produce any symptoms, the introduction of the other micro-organisms will enable it to make a start. In order that the streptococcus should kill the patient, it is not necessary that it should leave the cavity of the uterus, and infect the whole body. The experiments of Vaillard and others have shown that some micro-organisms produce poisons of so deadly a nature, that an infinitesimal quantity of them will prove fatal even when the micro-organism is still localised in one spot and has not invaded the body. These poisons are chiefly formed in albuminous fluids, and one may well imagine what a quantity of poisons the streptococcus pyogenes and other micro-organisms will produce when thriving in a warm chamber like the uterus, and being cultivated on rich albuminous food, such as the lochia of a parturient woman. Even should the disease be localised at first, the absorption of these poisons will favour the dissemination of the micro-organism; for experiments have shown that micro-organisms spread with

wonderful rapidity throughout the body if a small quantity of their poisons be injected at the same time. The bacillus of tetanus, for instance, if completely freed from poison, is quite harmless, even when injected in large doses; but if a small quantity of its own poison be added, it at once begins to thrive, and kills the animal.

It must be remembered that the poison secreted even by harmless micro-organisms is dangerous. In the human body these poisons are being always secreted in the intestinal canal, from whence they may be absorbed or neutralised and excreted. Hence the necessity of carefully attending to the state of the patient's bowels, for the increased absorption of bacterial poisons from the intestine must favour infection as surely as if such poisons were introduced under the skin.

All this has led to the rise of a new school of hygiene, and to laboratories consecrated to bacteriology. In London, the Society for the Advancement of Medicine by Research, supported by all the combined authority of our colleges and universities, has done good work by its publications and distribution of valuable tracts. But it has done little more than assist in removing some of the impediments thrown by ignorant obstruction in the way of experimental research. Time, and energy, and money which might have been expended in assisting original observers, have been more or less wasted in clearing away opposition to advances. The Institute of Preventive Medicine is entering upon a more encouraging course, supported by a share of the Berridge bequest, and with a prospect of further help from public bodies. An account of this Institute and its aims, by Dr. Ruffer, is here on the table, and I am sure will interest those who will read it. The College of State Medicine, which has quite recently united with the Institute, will add greatly to its strength and power of doing good. And if only the three institutions could be formed into one powerful association—united as they *are* in a common object, as they *would be* by concentration of energy and individual support—we should possess a grand national home for experimental research, and for the advancement of scientific medicine, preventive and curative, as would be certain so to add to our knowledge of the causes of preventable diseases, and the means of preventing and curing them, as to deserve the gratitude of mankind. Just now such a consummation seems to be within our reach. By gaining knowledge we gain power—power for good, the power to prevent preventable disease, the power to advance the science and art which it is our vocation to study and practise for the common good—the common health of the commonwealth.

If we pass from general principles to practical details in our study of the way how to prevent preventable disease, the question of asepsis or antisepsis, alone or combined, at once arises, and we are met with the conviction that apart from the toxic action of some antiseptics, there is another reason which makes asepsis preferable to antisepsis. The memorable work of Metchnikoff has shown the importance of leucocytes in the healing of wounds and the prevention of infection. He has shown that the leucocytes and other allied cells are phagocytes, and that they destroy micro-organisms, preventing them from entering the body.

Now, Dr. Ruffer, working in the conjoint laboratories of the two London colleges, has shown that all antiseptics, if introduced under the skin, repel leucocytes. Thus, if a small piece of sterilised sponge be introduced under a guinea-pig's skin, it will be filled with leucocytes in a few hours; but if it be previously soaked in 1 in 20 carbolic acid solution, in turpentine, or in 1 in 1,000 sublimate, not a single leucocyte approaches it even after a lapse of some hours. He has also shown that if a bacillus which is in itself harmless to a rabbit, such as the bacillus Chauvoei, be introduced together with a drop of lactic acid, the lactic acid prevents the approach of the phagocytes, the bacilli get a fair start, and the animal invariably dies of the disease.

I shall presently recur to the antiseptic question, but wish first to say a few words as to whether cancer may be added to the list of preventable diseases. Perhaps none of the questions which now interest a large number of pathologists is exciting more attention and discussion than that of the origin and prevention of cancer. At the present moment it is not too much to say that the subject is one of the most obscure in the whole domain of pathology. It is true that the anatomical lesions of cancer have been well studied, but as to the real causes of it very little is known. To say that a cancer is due to a chronic irritation, or to some fœtal structure which suddenly springs into activity, is not an explanation; for the lesions of chronic irritation disappear after the cause is removed. A pipe-smoker who gets cancer of the tongue is not cured when he gives up smoking. A fœtal structure, like a dermoid cyst, may by its growth compress the neighbouring tissues, but it gives rise to no secondary deposits, unless a new element, the malignant or cancerous element, be added. What, then, is that something more which turns a chronic lesion into an active malignant growth? When pathologists first began to study bacterial life it was supposed that cancer might be due to bacteria, until the experiments of Ballance and Shattock

showed that cancerous growths were free from bacterial life. Was it, then, due to some higher organisms, such as protozoa? The subject has been and is even now the subject of controversial writing, but at any rate much light has been thrown on the subject by the observations of Sudakewitch in Russia, and Ruffer and Walker in England, observations which have been confirmed by so eminent a zoologist as Metchnikoff. These observers find in all cancers parasitic bodies, which, in their opinion, belong to the protozoa, and which inhabit the epithelial cells forming the tumour. More lately Ruffer and Plimmer have described the modes of reproduction of the parasites, which multiply by fission into two, four, eight or more young parasites. The latter observers, however, have committed themselves to no opinion as to the causation of cancer by these protozoa; for, although their investigations open a new field for research, the final answer to this question can only be gained through experimentation on animals.

Indeed, the question is a particularly difficult one. The contagion of cancer has been suggested; it has never been proved, and the balance of evidence is against it. On the other hand, there are many facts showing that the inhabitants of certain districts, of certain houses even, are greatly afflicted with the disease. If that be so, then one ought to consider cancer as a kind of endemic disease resembling malaria; with this difference, however, that even after he has left the infected district the cancerous patient never gets well. But by studying the life history of this parasite, both inside and outside the body, together with inoculation on animals and carefully prepared statistical records, may we not hope that means will soon be found to arrest the spread of this horrible disease? May we not hope, further, that if it be shown to be a preventable disease, means may be found for its prevention? And is there not some ground for the suggestion that one of the early steps in the enquiry will be that notification of cases of cancer should be made compulsory, as if this disease were one connected with the functions of medical officers of health under the Notification of Infectious Diseases Act. Time does not permit me to say much as to the operation of this Act, and occasional opposition of the public, but it is certain that when well worked in any district the gain to the inhabitants is beyond doubt, and I fully agree with the opinion of Dr. Seaton, published in the *Times* last week, that there are so many important questions arising out of the working of the Notification Act, and so many special qualifications now required of the medical officers of health, that it will become necessary, "in order that in the future the supply shall equal the

demand, to materially improve the *status* of medical officers of health in point of salary, which in towns should be on the same basis as those of the town clerk and other important functionaries."

Assuming that if preventable diseases are to be prevented, early notification of cases as they occur must be insisted on; and when they end fatally the cause of death must be always accurately certified, another important question arises—How should we dispose of the dead body? It is certain that the body contains innumerable microbes which are the seeds or germs of the disease which has caused death. Some of these disease-germs, perhaps all of them in some bodies, may be destroyed as putrefaction goes on. But it can be proved, beyond all contradiction or doubt, that in many cases the microbes, or some of them, are not destroyed, but are preserved in the earth for many years, retaining their destructive powers and leading to fresh outbreaks of infective or preventable disease either by polluting water supplies, or by earth worms bringing the microbes up to the surface of the ground, or by more direct action on man or animals after the disinterment of the dead bodies. I hesitate before offering you another pamphlet, but to save your time now, I have some copies of an article published in an American Review last February—*The Forum*—which has been reprinted and entitled "Cremation and Cholera." I might have called it "Cholera a preventable disease and how to prevent it." Perhaps some of you may read what I wrote, so I will now only refer to the argument that the germ of cholera is "a living poison which has the power of multiplying itself with amazing rapidity, a *bacillus* which, having found its way into water, either stagnant or running as a stream or river, spreads, under varying degrees of temperature, very much like the countless myriads of minute beings which make the sea phosphorescent with their gleams for many miles.

"The rapid increase of animal poison is incalculable. An atom of small-pox matter inoculated as fluid, or borne by the wind when dry, multiplies itself many thousand fold in the person so poisoned. A minute speck of the mucous discharge from an animal affected by cattle plague, if put into the blood of a healthy ox, increases so fast that in a few hours the whole of the blood of the animal, weighing many pounds, is so poisoned that every drop of the blood contains enough poison to convey the disease to another animal within forty-eight hours."

Any of you who will favour me by a glance at the article written for the information, not so much for our profession as

of the intellectual classes in America, may see that I have attempted to make generally known the doctrine that as the germs of preventable diseases may be preserved for many years in the earth, the present custom of disposing of the dead bodies of those killed by these diseases is a source of great danger to the living. You may read an extract from your member—Dr. Cameron's—article entitled "The Modern Cremation Movement," in the *Scottish Review* of July, 1887. I will not detain you by reading the whole of the extract, but the conclusion of Dr. Freire, the accuracy of whose statements Dr. Cameron has carefully examined, is so much to the point that I cannot omit it. Dr. Friere says—"The practice of cremating the bodies would be the surest means of extinguishing the epidemics which every year ravage, with greater or less intensity, our most flourishing centres of population. If each corpse," he adds, "is the bearer of millions of millions of organisms that are specifics of ill, imagine what a cemetery must be in which new foci are forming around each body. Imagination is incapable of conceiving the literally infinite number of microbes that multiply in these nests. In the silence of death these worlds of organisms, invisible to the unassisted eye, are labouring incessantly and unperceived to fill more graves with more bodies destined for their food, and for the fatal perpetuation of their species."

I have been very glad to learn since my arrival here that before very long the progress of the modern cremation movement will be assisted by the example of Glasgow. Your Society has ample funds for *beginning* the new building in an admirable site already obtained, and there can be no doubt that its *completion* will not be delayed by the indifference of your wealthy citizens. Glasgow, by its water supply, excites the envy and admiration of London, and of nearly all our largest English cities. The sanitary powers so ably directed by your Lord Provost and Council, and the practical work of your indefatigable officer of health, Dr. Russell, have already proved of great advantage to all classes of your immense population. A visitor may perhaps wish that the abatement of the smoke nuisance may be more rapid and complete—and congratulate you on the daily destruction of much of the refuse of the city by fire—but I trust that not only the members of this Society, but the members of the profession generally in Glasgow, will impress upon your municipal authorities the growing belief that so long as the custom of burial of the dead bodies of those who die of preventable diseases is continued, the death-rate will remain far too high, and it will be impossible to prevent preventable diseases.

In concluding this very imperfect sketch of a subject of incalculable interest, not only to this nation, but to all mankind, permit me to add that I have been delighted to watch the progress made by the graduates of your University, and the practitioners qualified by your Faculty and Colleges, not only in the practice of the art, but in the study of the science of medicine in its widest sense—both curative and preventive; and if some of us of the present generation, looking upon ourselves as practical men, are disposed to smile at some of the refinements of new methods of research —perhaps to doubt their real value to the physicians and surgeons of the future, and to humanity—permit me to read to you what the late Prime Minister (Lord Salisbury) said lately at Oxford, when advocating a closer cultivation of the science of medicine in that ancient university. He said— "Now, partly under the pressure of human necessity, there is another feature of this infinitely small—the bacilli—which is attracting more and more the attention of the scientific intellect of Europe. It is always dangerous to prophesy, but I do not think any one who has watched the course of science will doubt that, for a generation to come, the investigations of these creatures, which have been revealed to us by new methods of research, and by singularly patient labour, and upon which the lives of millions of human beings depend, will figure larger in the scientific field than any other object of study, and these are the special domain and privilege of medicine." What Lord Salisbury said this year may well be considered together with what Lord Beaconsfield said in 1872 —twenty years ago. These are his words:—"In my mind, the great social question which should engage the attention of statesmen is the health of the people; for it refers to all those subjects which, if properly treated, may advance the comfort and happiness of man. A very great man, and a very great scholar, two or three hundred years ago, said that he always thought that in the Vulgate that wise King of Israel, when he said, 'Vanitas vanitatum, omnia vanitas,' should really have said, 'Sanitas sanitatum, omnia sanitas.' I am sure that had King Solomon said that, he could not have said a wiser thing." If the statesmen of the present day, and the future, will think less of the struggles of place and party, and more of the health of the people, they will not act as if the members of the profession, who practice the arts which are useful to all mankind, were unworthy of national reward and public gratitude. Nor can they regard, as the least of these claims, the efforts we are making for "the prevention of preventable disease."