INTRODUCTORY ADDRESS ON PUERPERAL FEVER A PREVENTABLE DISEASE:

A PLEA FOR THE MORE GENERAL ADOPTION OF ANTI- SEPTICS IN MIDWIFERY PRACTICE.

*Delivered at St. Thomas's Hospital, at the Opening of the
Session 1888-9.*

By CHARLES J. CULLINGWORTH, M.D., F.R.C.P.,
Obstetric Physician to the Hospital.

THE subject I have chosen for to-day's lecture is the preventability of puerperal fever.¹

Childbirth is not uncommonly regarded as a simple physiological process; painful certainly, but, with a few rare exceptions, natural and safe. Unless your attention has been specially directed to the subject it will probably not have occurred to you to consider how far this popular notion is correct. As a matter of fact, it is very incorrect. In the latest report of the Registrar-General 3,877 deaths are stated to have occurred from childbirth in England and Wales in the year 1886, including 479 in the single registration district of London. The numbers for the previous year (1885) were still larger. These figures are sufficiently startling, but they do not represent the whole truth. A great many deaths from childbirth are not returned as such, but appear under entirely different headings. It often happens that a woman dies from some puerperal disease, say, peritonitis, and on the death-certificate the name of the disease appears without any mention of its connection with childbirth. This is due partly to carelessness, partly to the reluctance of medical men to create alarm in the public mind, and partly also to the uncertainty that occasionally arises in the mind of the medical attendant as to whether the fatal disease was attributable to childbirth or to some independent cause. The fact that many of the returns are inaccurate in the direction here indicated is well known to the authorities. Ever since the year 1881 letters of inquiry, asking for further particulars, have been issued from the office of the Registrar-General to medical men who had given certificates in which the causes of death were imperfectly stated. In one year alone (1881) the result of sending out these letters was the discovery of 330 additional deaths due to childbirth.

This question of childbirth mortality was made the subject of a most thorough and painstaking inquiry some years ago by Dr. Matthews Duncan. He arrived at the conclusion that "not fewer than 1 in every 120 women, delivered at or near the full time, die within the four weeks of childbed." This statement was received with astonishment and incredulity. The late Dr. Farr, of the Registrar-General's office, who had, in 1856, declared the mortality of childbed in England and Wales to be 1 in 189, denounced Dr. Duncan in good round terms as an alarmist. Before his death, however, he came so nearly to accepting Dr. Duncan's estimate as to allow that one woman in 129 died in childbed.

Dr. Duncan's conclusions were published in 1870. I know of no equally thorough investigation having been made since, but I see no reason to think that the mortality in this country is less now than it was then.

TABLE I.—Registrar-General's Return of Puerperal Mortality in England and Wales for 1867 to 1869 and 1884 to 1886.

Year.	Children Born Alive.	Deaths from Childbirth.	Mortality per 1,000.
1867	768,349	3,412 (puerperal fever, 1,066)	4.44
1868	786,858	3,503 (" 1,096)	4.45
1869	773,381	3,283 (" 1,181)	4.24
			Average 4.37
1884	906,750	4,347 (" 2,468)	4.79
1885	894,270	4,449 (" 2,420)	4.98
1886	903,866	3,877 (" 2,078)	4.29
			Average 4.68

¹ Much fault has been found with the term "puerperal fever." It has, however, certain unmistakable advantages. Everyone knows what is meant by it; it is

In the first table are shown the Registrar-General's returns (1) for the three years preceding the publication of Dr. Duncan's book, and (2) for the last three years for which the returns have been issued. The difference will be seen to be exceedingly slight. What little difference there is in the direction of increase rather than of diminution. So far, then, as regards childbirth mortality in general.

With regard to the causes of death from childbirth, they are of course various. A considerable number of women lose their lives annually from hæmorrhage (as in placenta prævia), from puerperal convulsions, etc.; but by far the majority die, not from accidental complications such as these, but from puerperal fever. The exact proportion it is at present impossible to ascertain. The most reliable statistics go to show that puerperal fever, in one or other of its manifestations, is accountable for at least 65 to 75 per cent. of all the deaths from childbirth. In the meantime, although we know them to be far below the truth and utterly useless for purposes of exact investigation, we may accept the figures of the Registrar-General's report as sufficient for our present purpose. We may at least be sure that they do not err in the direction of excess. Taking these, then, without any attempt at correction, we find that no fewer than 6,966 deaths from puerperal fever have been certified as such within the three years 1884-86, an average of 2,322 cases per annum in England and Wales.

I hope, before I conclude, to succeed in convincing you that almost the whole of this mortality may in future be avoided, and that puerperal fever may be practically stamped out. The nature, causes, and treatment of puerperal fever have long been a favourite theme with medical writers. More is said to have been written on this than on any other disease. Dr. Fordyce Barker found that, within the comparatively short period of twenty years (1854 to 1874), upwards of 20,000 pages had been published on the subject. The fact that scarcely anything was known about it did not in any way preclude vast numbers of men from propounding their views and theories, with a dogmatism of which a sister profession has been erroneously supposed to have a monopoly. In the meantime, amidst this cloud of talk, certain facts were being accumulated which were of the highest significance. Let me call your attention to a few of them.

First in importance are certain facts showing that puerperal fever may be carried from patient to patient by medical men, midwives, and nurses. Let me give you two or three from amongst the large number of well-authenticated observations bearing on this point. I shall go a long way back for my selected examples, so as not to wound the susceptibilities of persons now living.

In the year 1795 Dr. Alexander Gordon published an account of an outbreak of puerperal fever which occurred at Aberdeen between December, 1789, and March, 1792. "The disease," he says, "was not peculiar to any particular constitution or temperament, but promiscuously seized women of all constitutions and temperaments, for the strong and the weak, the robust and the delicate, the old and the young, the married and the single, those who had easy and those who had difficult labours, were all equally and indiscriminately affected. It prevailed principally among the lower classes of women, and, on account of my public office and extensive practice in midwifery, most of the cases came under my care. But women in the higher walks of life were not exempted when they happened to be delivered by a midwife or physician who had previously attended any patients labouring under the disease." He gives a table of 77 cases that came under his own care. "The midwife who delivered No. 1 in the table carried the infection to No. 2, the next woman whom she delivered. The physician who attended Nos. 1 and 2 carried the infection to Nos. 5 and 6, who were delivered by him, and to many others. The midwife who delivered No. 3 carried the infection to No. 4, from No. 24 to Nos. 25 and 26, and successively to every woman whom she delivered. The same thing is true of many others, too tedious to be enumerated. It is a disagreeable declaration," he continues, "for me to mention that I myself was the means of carrying the infection to a great number of women.I arrived," he says in another place, "at that certainty in the matter that I could venture to foretell what women would be affected with the disease upon hearing by what midwife they were to be delivered or by what nurse they were to be attended during their lying-in, and almost in every instance my prediction was verified."

comprehensive, and it does not necessarily involve any theory as to the nature of the disease.

Not less striking is the evidence of Mr. Robertson, of Manchester, with regard to an incident that occurred in the maternity department of St. Mary's Hospital in that city in the year 1830. I will give the circumstances in Mr. Robertson's own words.

"Mrs. A. B., a midwife, in great practice among the patients of the charity, had, on December 4th, 1830, delivered a poor woman, who soon died with symptoms of puerperal fever. From this date to January 4th inclusive, exactly one month, this midwife delivered 30 women residing in different parts of an extensive suburb, of which number 16 caught the disease, and all of them ultimately died. These were the only cases of puerperal fever which had recently occurred in connection with the charity. The midwives, commonly 25 in number, then delivered on an average about 90 women per week, or nearly 380 in a month. Now, of this number delivered during the month in question, none had puerperal fever except the patients of Mrs. A. B. Yet all the time this woman was crossing the other midwives in every direction, scores of the patients of the charity being delivered by them in the very same quarters where her cases of fever were happening."

In describing an outbreak at Plymouth in 1831, Mr. Blackmore says:—

"Case 1 of my series was the second of 8 or more cases of puerperal fever that occurred in the practice of one accoucheur within a fortnight. During the next fortnight he had 7 more cases, which all ended fatally. In the week following at least 3 women delivered by him took the fever, of whom 2 died, and several cases occurred in his practice subsequently. I make out that in the practice of this medical man at least 18 cases of puerperal fever occurred in rapid succession, most of them at a time when all the other practitioners of the town had not met with a single case of the disease."

Instances of a similar kind might be multiplied almost indefinitely, but I must pass on to speak of another fact that was continually receiving confirmation, namely, that the disease may be carried to lying-in women from the *post-mortem* room.

The late Sir James Simpson related that "in the winter of 1836-37, Dr. Sidey had five or six fatal cases of puerperal fever in his practice in rapid succession, no other practitioner in Edinburgh having had any. Simpson attended the examination of the body in two of the cases, and took the diseased parts into his hands so as to examine them more closely. The next four women delivered by himself took puerperal fever, and these were the first cases of the disease that he had ever had in his private practice.....A practitioner in Leith, who had examined a piece of the uterus which Simpson had brought home with him, had three cases of puerperal fever among his patients directly after."

The most striking piece of evidence on this point, however, came from Vienna. The story is one that ought never to be forgotten. I will epitomise it as briefly as possible from an admirable paper by Dr. Duka in the *Lancet*, July 31st and August 7th, 1886, which I recommend you all to read.

In the early part of 1846, a young Hungarian, named Ignatius P. Semmelweis, was appointed assistant to Professor Klein, the head of the maternity department in the General Hospital at Vienna. For some years previously the mortality from puerperal fever in that hospital had been excessive. The death-rate, which during the first thirty-nine years of its existence was only 12½ per 1,000 (879 deaths out of 71,395 admissions), rose to 50, and sometimes to more than 70, per 1,000. A peculiar feature of this increase in the mortality was that it was most marked in that portion of the department where the students received their instruction; while in Dr. Bartsch's clinic, in which instruction was given exclusively to midwives, the increase was comparatively slight. During the six years 1841-46 the mortality per 1,000 in the student's clinic was 92; in that of the midwives, 33.8. The Government issued one commission of inquiry after another, but no satisfactory explanation of this difference was forthcoming. Atmospheric influences were clearly not the cause, and, as to overcrowding, Professor Klein's clinic was the less crowded of the two. It was said that things would be changed if the number of foreign students was diminished; accordingly, half of them were sent away, and yet the death-rate remained unaffected. The bell that rang outside young Semmelweis's door every time the priest came to administer the last sacrament to the dying filled him with horror, and roused in him a strong determination to find out the cause of this fearful mortality. He noticed that women who were delivered before arriving at the hospital—and such cases occurred to the number of a hundred—almost all escaped. He further no-

ticed that nearly every case of protracted labour in Professor Klein's clinic terminated fatally, while in the No. 2 clinic the duration of labour made no difference. At last, the light dawned upon him. A friend died from the effects of a dissection wound. The symptoms of his friend's illness were identical with those continually observed in the puerperal fever cases under his care. Here, then, was the clue. In Clinic No. 2 the patients were attended entirely by midwives, who had nothing to do with dissections and *post-mortem* examinations. In Clinic No. 1 the women were delivered by students. A great impetus had of late been given to the study of anatomy and pathology in Vienna, and the students were diligent in their attendance in the dissecting and *post-mortem* rooms. All they did in the way of purifying themselves was to wash their hands with soap and water. It became clear to Semmelweis that the poor women in No. 1 Clinic lost their lives from the same cause as his friend, Professor Kolletschka. In May, 1847, he gave orders that, in the Clinic No. 1, every person should, before proceeding to examine any patient, wash his hands in liquid chlorine or chlorinated lime-water. The mortality at once fell. By the following November and December it had fallen to 30 per 1,000, and in the second year of the experiment the mortality was reduced to 12½ per 1,000, a lower rate than prevailed even in Clinic No. 2. In the enunciation of his views, Semmelweis evoked the most bitter opposition. His life henceforth was a ceaseless struggle. An object of dislike and ridicule, he became despondent and irritable, until at last his mind gave way under the strain. But, in the meantime, he had accomplished a great work, not only, as Hirsch says, for the Vienna Hospital, but for mankind at large; and he has left behind him a name that obstetricians, and surgeons too, should ever delight to honour.

The discovery, some years later, of the active part played by micro-organisms in the production of septicæmia furnished the key to the whole situation. Everything was accounted for. The propagation by personal contact; the manner in which the disease dogged the footsteps of individual practitioners and became the scourge of lying-in hospitals; the fatal results of cadaveric contamination; the deleterious influence of protracted labour, involving as it did repeated examinations; the almost entire immunity from the disease of women confined in the streets and elsewhere, in whom no examination at all was made; the success that attended the purification of the hands by means of chlorine—all these facts were now easily explained.

Already, in a well-known and thoughtful essay, the late Sir James Simpson had called attention to the analogies between puerperal and surgical fever, and had shown not only how similar were the two diseases in their symptoms and the morbid lesions they left behind them, but also how the anatomical condition of the patient is practically the same in both. Corresponding to the wound of the surgical patient, we have in the obstetrical always a wounded surface within the uterus where the placenta was attached, and very often, in addition to this, wounds of the cervix uteri, of the vagina, and of the perineum. The facilities for infection by morbid matters are thus as great after delivery as after a surgical operation. In each case micro-organisms, if once brought into contact with the exposed surface, find a ready entrance. How much the knowledge of the dependency of septicæmia on micro-organisms, and the methods of treatment founded upon it, have accomplished for surgery, I need not in this hospital remind you. What I desire to impress upon you to-day is that they are capable of effecting an equally stupendous revolution in midwifery.

The old idea of puerperal fever was that it was sometimes the result of infection from without (heterogenesis), and sometimes of infection from within (autogenesis). There is now abundant evidence to show that the disease is always due to the introduction of pathogenic micro-organisms from without. These micro-organisms may either be varieties of septic bacteria or the common bacteria of putrefaction. The *modus operandi* differs in the two cases. The septic bacteria, finding an entrance through some wounded surface in the genital tract, make their way into the blood and tissues of the patient, and, multiplying there, become the active cause of the disease. The common bacteria of putrefaction also enter the genital tract from without, but their influence is exerted, not by becoming absorbed and distributed in the blood and tissues, but by setting up the process of putrefaction in any *débris*, whether of placenta, membrane, or blood-clot, that happens to be retained in the uterus or vagina. Such *débris* may be present, and may be the cause of hæmorrhage; but, unless bacteria obtain access to them, they will not undergo putrefaction,

the presence of bacteria being essential to that process. When they do obtain access and putrefaction is set up, certain poisonous chemical products are given off, which, if absorbed into the system, are capable of giving rise to puerperal fever.

The great difference between puerperal fever caused by septic bacteria and that caused by putrefaction is, that whereas in the former there is a living, self-multiplying poison in the system which, once introduced, must run its course, there being no antidote as yet known to us except such as would at the same time destroy the life of the patient, in the latter the poison, though capable, if left to itself, of producing deadly results is, if the source of the poison be removed and its absorption arrested, quickly eliminated from the system, with entire relief to the dangerous symptoms.

Fortunately the same means that prevent the one form of puerperal fever prevent the other, what is required in both cases being that no micro-organisms shall be allowed entrance to the genital tract either during or immediately after the process of parturition.

It is not possible, so far as I know, absolutely to distinguish at the bedside that form of puerperal fever caused by septic micro-organisms from that caused by the products of putrefaction. The rule of treatment, therefore, when symptoms of puerperal fever show themselves is, first of all, to make sure that the uterus and vagina are perfectly empty and clean. If the case be one of putrid intoxication (sapremia, as Dr. Matthews Duncan calls it) the symptoms, after the cleansing out of these two cavities, will at once subside; if not, no harm will have been done.

The circumstance that the retention of *débris* in the genital passages is an essential factor in the production of puerperal fever due to putrid intoxication has led to this form of disease being described as autogenetic. Nothing could be more misleading. "To admit," says Fritsch, "the existence of a spontaneous infection is to take a long step backward." Not only so, it is to paralyse effort and destroy hope. "The doctrine of autogenesis," exclaims Parvin, "is a confession of ignorance, the creed of fatalism, the cry of despair,.....the very pessimism of obstetric medicine."² I hope, to-day, to contribute in some degree to the overthrow of a doctrine that has caused incalculable mischief.

And now let me bring before you some of the results of the employment of antiseptics in midwifery. The obstetricians have been slower than the surgeons to profit by the teachings of Lister, and even now I am ashamed to say that British obstetricians are far behind their Continental brethren in this matter. Let me take, first of all, the experience of the great lying-in hospital at Vienna, the largest institution of the kind in the world. I have already recounted to you one interesting episode in its history. In a paper recently published, Professor Braun von Fernwald has given us a statistical statement commencing with the year 1857, when he took charge of the clinic. The account covers a period of twenty-nine years. During this time there were 108,889 births in the hospital. In the first six years (1857-62) the mortality was 28 per 1,000. A number of hygienic improvements were then carried out, and the heating and ventilating apparatus was reconstructed. The consequence of these measures was a reduction of the mortality during the next eighteen years (1863-80) to 16 per 1,000, the deaths from puerperal fever being at the rate of 13 per 1,000.

TABLE II.—Imperial Lying-in Hospital, Vienna.

Date.	Deliveries.	Deaths.	Mortality per 1,000.
1857-62	25,123	722	28
1863-80	68,770	1,117	16
1881-85	15,070	107	7

Mortality from Puerperal Fever.

Date.	Rate per 1,000.
1863-80	11
1881-85	4

Then came the introduction of antiseptics, and during the next five years (1881-85) the total mortality fell to 7 per 1,000, and the mortality from puerperal fever to 4 per 1,000. It is worthy of note that during the 29 years in question no fewer than 7,964 students attended the clinic. It should also be remembered that in a hospital of this kind there is a large percentage of dangerous and difficult cases. In proof of this I may point out that during the five years, 1881-85, amongst 15,070 deliveries, the number of operations was 2,543, including 9 Cesarean sections. These facts

serve only to increase our admiration at the marvellous results obtained.

I have spoken first of the Vienna Hospital, because its statistics deal with such large numbers as to have, on that account, a special value. Passing on now to Dresden, you will find the results there even more remarkable. Professor Leopold has published an elaborate and most interesting record of the cases under his care in the Dresden clinic up to the end of last year, 1887. The following table shows the number of deaths and rate of mortality from septicæmia (originating in the hospital) during the past four years.

TABLE III.—Dresden (Leopold).

Date.	Deliveries.	Deaths from Puerperal Fever Originating in Hospital.	Mortality per 1,000 from Puerperal Fever.
1884	1,368	12	8.7
1885	1,365	2	1.4
1886	1,387	2	1.4
1887	1,388	1	0.7

The total mortality in the year 1872 had been 50 per 1,000, that in the years 1886 and 1887 was 10 per 1,000; 14 deaths having occurred in each of the two years.³

The observation I made, when speaking of the Vienna Hospital, as to the large proportion of difficult and dangerous cases, holds good also with regard to the hospital at Dresden. For example, out of 2,775 women delivered in the last two years, 396, or 14 per cent., required operative interference; 27 of the patients suffered from eclampsia, 23 had placenta previa, and 224 had well-marked contraction of the pelvis. Amongst the operations performed were no fewer than 15 Cesarean sections. To have a total mortality of only one per cent., under these circumstances, is surely an achievement to be proud of. But Leopold's success does not by any means end here. The salubrity of a lying-in hospital is to be measured, not by its mortality only, but by the amount of sickness in its wards. The statistics of the Dresden Hospital show that, of the patients confined there in 1886, 77.8 per cent. made a perfectly normal recovery, while, in 1887, the number of such recoveries actually reached 95 per cent.⁴

TABLE IV.—New York Maternity Hospital.

Year ending.	Deliveries.	Total Number of Deaths.	Deaths from Sepsis.	Mortality per 1,000 from Sepsis.
Sept. 1883	429	34	26	60.6
" 1884	505	7	3	5.9
" 1885	541	4	1	1.8
" 1886	463	4	1	2.1

TABLE V.—Boston Lying-in Hospital.

Date.	Deliveries.	Total Number of Deaths.	Deaths from Sepsis.	Mortality per 1,000 from Sepsis.
1882	288	17	16	55.5
1883	242	14	11	45.8
1884	310	6	5	16.1
1885	308	4	2	6.4
1886	373	3	0	0

Turning to the United States, it will be seen from the extremely interesting tables before you that both New York and Boston are able to furnish similar overwhelming testimony to the value of antiseptics, the improvement in their results keeping pace with improvements in their methods, until the mortality from puerperal fever at the New York Hospital has been reduced from 60 per 1,000 to 2 per 1,000, and at the Boston Hospital from 55 to 0.

TABLE VI.—Paris Maternité (Tarnier).

Date.	Mortality per 1,000.
1858-69	43
1870-81	23
1882-87	11

³ This seems to give an unusually large proportion of deaths not due to puerperal fever. It may therefore be well to mention the actual causes of death, other than puerperal fever, originating in the hospital in these two years. In 1886, six women died from eclampsia, two from severe nephritis and uræmia, one from acute pneumonia (ill on admission), one from exhaustion after decapitation of the child for impacted shoulder, one (a case of angular curvature) from intense dyspnoea, and one committed suicide. In 1887, two women died from eclampsia, four from placenta previa, one from granular kidney, one from intestinal perforation, one from acute meningitis following ear disease, one from rupture of the uterus, one from septic peritonitis (present on admission), and two from exhaustion. Of the two cases that died from exhaustion, one came into the hospital with her genital organs bruised, torn, and bloodless after repeated attempts at turning, and the other was a case of impacted breech, admitted after having been five days in labour.

⁴ By a normal recovery is here meant one during which the temperature never, even on a single occasion, exceeded 100.4° (38° C.).

Scarcely less striking is the record of the *Maternité* at Paris: From 1858 to 1869 the mortality was 93 per 1,000; this Tarnier calls the period of inertia. From 1870 to 1881 the death-rate fell, in consequence of the adoption of hygienic measures, to 23 per 1,000; while, in the six years 1882 to 1887, during which antiseptic precautions were rigidly observed, the mortality was only 11 per 1,000, or little more than 1 per cent.

Such instances could be multiplied almost indefinitely. I will, however, only inflict one more upon you, that of our near neighbour the General Lying-in Hospital in York Road. Until the year 1877 this hospital was scarcely ever free from puerperal fever, and the mortality, always high, occasionally became fearful. In 1838, of 71 women delivered, 19 died; in 1861, 14 died out of 195; and in 1877, 9 out of 63. On several occasions the hospital had to be closed for long periods, and thousands of pounds were spent on the sanitary improvement of the building. Since October, 1879, when it was reopened after having been closed for two years, the hospital has been conducted on antiseptic principles, the details varying from time to time as increased knowledge and experience dictated. Mark the result. The total mortality, which from 1833 to 1860 averaged 30.8 per 1,000, and from 1861 to 1877 17 per 1,000, has fallen during the last eight years to an average of 6 per 1,000.

TABLE VII.—General Lying-in Hospital.

Date.	Deliveries.	Deaths.	Average Mortality per 1,000.
1833 to 1860	5,833	180	30.8
1861 to 1877	3,773	64	17
1880 to 1887	2,585	16	6

Puerperal fever has been almost entirely banished. Only one death has taken place from this cause during the last three years, and it has come to be regarded as quite an unusual event for a patient's temperature during convalescence to exceed 100° F.

In the face of such results as these, it is surely time to give up talking about an autogenetic variety of puerperal fever. The precise character of the antiseptic measures to which these wonderful results are due varied in different hospitals, and varied, too, in the same hospital from year to year. It would, therefore, serve no good purpose to attempt to describe them in detail. The object at which they all aimed was the same, namely, the exclusion of pathogenic micro-organisms from the genital passages. As to the best methods of effecting this object, there is, no doubt, still some difference of opinion. The best authorities, however, are, I believe, quite agreed:—

1. That the fundamental rule in antiseptic midwifery, the neglect of which renders all other measures futile, is to ensure perfect antiseptic cleanliness of the hands of the attendants, of any instruments or appliances that may be required, and of everything that is liable to be brought into contact with the genital passages.
2. That the most efficient antiseptic for this purpose at present known is corrosive sublimate.⁵
3. That the best method of ensuring antiseptic cleanliness of the hands is to wash them thoroughly with soap and warm water, using a nail-brush vigorously, and then to rinse them carefully, again with the help of a nail-brush, in a solution of corrosive sublimate, 1 in 1,000.
4. That if the patient has been already examined without antiseptic precautions, the vagina ought to be irrigated with a germicide solution as a preliminary proceeding.
5. That if, for the foregoing or any other reason, sublimate irrigation be employed, care should be taken to avoid any of

⁵ It may be useful to restate here the grounds on which corrosive sublimate is now accepted as the most reliable of all known disinfectants. In 1874, Billroth showed that septic bacteria were killed by a solution of corrosive sublimate, 1 in 9,600 (*Untersuchungen über die Vegetationsformen von Cocco-Bacteria Septica*, Berlin, 1874), and in 1881, the researches of Koch as to the relative power possessed by various reputed antiseptics in the case of the spores and bacilli of anthrax established the superiority of sublimate in a most remarkable manner. The spores of anthrax are exceedingly tenacious of life, probably surpassing in this respect any germs of micro-organisms hitherto known. A solution of carbolic acid, 1 in 20, required two days to kill them, yet a momentary contact with a solution of corrosive sublimate, 1 in 5,000, sufficed to destroy them immediately (*Mittheilungen aus dem Kaiserlichen Gesundheitsamt Bd. I.*, Berlin, 1881). In Koch's experiments, however, the conditions were such that the quantity of the disinfectant in solution came into the fullest action. Where the conditions are more complicated the solution will require to be stronger. Sufficient sublimate must be used under such circumstances to ensure that at least 1 in 5,000 of free sublimate shall remain in solution. In practice this condition is found to be fulfilled by using a solution of 1 in 1,000 (see Moritz, S., *Corrosive Sublimate as an Antiseptic in Surgery*, *Medical Chronicle*, vol. 1. Manchester, 1884-85, pp. 355, et. seq.).

the solution lodging in the passages, lest the patient be mercurialised.

With regard to the desirability of sublimate irrigation as a routine practice before and after delivery, opinions vary. It cannot be denied that some of the most brilliant results hitherto obtained have been obtained by those who regularly practise sublimate irrigation. On the other hand, however, there is the experience of the hospitals of New York and Boston, where the crowning success was achieved after irrigation as a routine practice had been entirely abandoned. Moreover, it must not be forgotten that several cases have been recorded where sublimate irrigation has resulted in fatal mercurial poisoning. For the ordinary douching of the vagina during the puerperal period, the simpler and non-poisonous antiseptic solutions are, in my opinion, quite as efficacious as the more powerful ones, and infinitely less dangerous; but as a disinfectant for the hands, instruments, and other appliances, corrosive sublimate is perfectly free from danger and at present stands unrivalled.

I plead to-day for the more general adoption of antiseptics in midwifery. The lying-in hospitals have very properly led the way; but, although many private practitioners have taken the matter up with enthusiasm, the practice of antiseptic midwifery is as yet far from being universal. There is still a notion abroad that this question of puerperal fever is one that chiefly concerns the lying-in hospitals. It is obvious, however, that the 2,708 deaths from puerperal fever registered in England and Wales in 1886 could not all be hospital cases. As a matter of fact, nearly two-thirds of them occurred in counties where not a single lying-in hospital exists; and even as to the remaining third, the lying-in hospitals of this country are so few in number and so comparatively small in size that they cannot possibly be accountable for more than an inconsiderable proportion of the cases. A certain number, no doubt, occurred in the workhouses, but the immense majority took place in the patients' own homes. The only way to avoid this terrible mortality, and to avoid also the enormous amount of puerperal disease which, because it is not fatal, remains unrecorded, is for every practitioner in midwifery to recognise his personal responsibility in the matter.

The essential antiseptic measures are very simple, and their habitual employment is by no means burdensome. A pint of corrosive sublimate solution of the proper strength (1 in 1,000) can be prepared in a minute or two from a 10-grain powder, a dozen of which can be put in a little box and carried in the pocket. In the powders supplied by my direction to the obstetric clerks in connection with our own maternity department at St. Thomas's, the 10 grains of corrosive sublimate are mixed with 50 grains of tartaric acid and a grain of cochineal. The tartaric acid increases the bulk of the powder and, what is more important, lessens the risk of a portion of the mercury being lost by precipitation, either from being formed into an insoluble albuminate,⁶ or from the alkalinity of the water, as in the case of London.⁷ The cochineal is of course merely a colouring agent to prevent the solution being mistaken for anything else.

A solution of corrosive sublimate does not, like solutions of potassium permanganate, lose its antiseptic property after being once used. It is, therefore, usually sufficient to prepare a supply on entering the lying-in room, to renew it when the labour is over, and afterwards to prepare a fresh solution once a day. The solution should be placed in a small bowl on the washstand by the side of the washhand basin, and kept there, ready for immediate use, from the time the first internal examination is made to the end of the puerperal week.

The best antiseptic lubricant with which we are at present acquainted is a solution of corrosive sublimate in glycerine,⁸ 1 part to 1,000, and this also can be easily carried about in a suitable and well-secured bottle.

In Germany the use of antiseptics in private midwifery practice is a matter of State regulation. You are no doubt aware that it is the custom in that country for all classes to be attended in their confinement by midwives, the doctors being summoned only in cases of difficulty or danger. Every midwife is compelled by

⁶ Laplace (R.): *Saurer Sublimat Lösung als desinficirendes Mittel und ihre Verwendung in Verbandstoffen.* *Deutsche Med. Woch.*, Leipzig, 1887, xiii, p. 866; see also *JOURNAL*, January 21st, 1888, p. 148.

⁷ Boxall (R.): The use of Acidified Corrosive Sublimate as an Antiseptic, *JOURNAL*, February 11th, 1888, p. 295.

⁸ Since Dr. Boxall introduced this preparation at the General Lying-in Hospital, and had the catheters kept partially immersed in it, cystitis after the use of the catheter has been unknown.

law to carry with her a bag containing all the necessary appliances. By the kindness of Dr. Matthews Duncan I am able to show you one of these bags. Here, in addition to the usual armament of catheter, scissors, tape, enema-syringe, etc., is all the apparatus necessary for disinfection, including the indispensable nail-brush; and, to give completeness to the arrangements, there is in every bag a book of instructions. If any midwife fails to use these things she is liable to punishment. The tendency of public opinion in this country is not in the direction of compulsory legislation in such matters. The use of antiseptics in Great Britain is, and is likely to remain, a question of individual responsibility, not of penal enactment. Surely it ought not on that account to be considered the less binding.

I have now stated my case. My plea has been on behalf not of the sickly, and aged, and useless members of the community, but of the mothers of this country, whose lives and health are of an importance quite incalculable. Tragedies such as those I have felt it my duty to relate to you are still being enacted in our midst. I know of a country town not far from London where, within the present year, puerperal fever has singled out the patients of one of the local practitioners exactly as it did at Plymouth and other places fifty and a hundred years ago. For six months every patient that he attended (with the exception of two, in whom labour was over before his arrival, and in whom, therefore, no examination was necessary) died of puerperal fever.

May I, in conclusion, borrow the words of one whom the whole English-speaking profession regards with affection and with pride, our venerable American *confrère*, Oliver Wendell Holmes, who, writing five and forty years ago of similar catastrophes, rose to an eloquence which even he has never surpassed? "It is," he says, "as a lesson rather than as a reproach that I call up the memory of these irreparable errors and wrongs. No tongue can tell the heart-breaking calamity they have caused. They have closed the eyes just opened upon a new world of love and happiness; they have bowed the strength of manhood into the dust; they have cast the helplessness of infancy into the stranger's arms, or bequeathed it, with less cruelty, the death of its dying parent. There is no tone deep enough for regret, and no voice loud enough for warning. The woman about to become a mother, or with her new-born infant upon her bosom, should be the object of trembling care and sympathy wherever she bears her tender burden, or stretches her aching limbs. The very outcast of the streets has pity upon her sister in degradation when the seal of promised maternity is impressed upon her. The remorseless vengeance of the law, brought down upon its victim by a machinery as sure as destiny, is arrested in its fall at a word which reveals her transient claim for mercy. The solemn prayer of the liturgy singles out her sorrows from the multiplied trials of life, to plead for her in the hour of peril. God forbid that any member of the profession to which she trusts her life, doubly precious at that eventful period, should hazard it negligently, unadvisedly, or selfishly."⁹

ADDITIONAL REFERENCES.

Anderson (A. Jasper): Corrosive Sublimate in Obstetrics and Gynecology (Review). *Med. Chron.*, vol. ii, p. 326, and iii, p. 412. Manch., 1885-6.—Barker (Fordyce): *The Puerperal Diseases*, New York, 1874.—Boxall (R.): The Conditions which favour Mercurialism in Lying-in Women. *BRIT. MED. JOURN.*, July 14th, 1888, p. 73.—Braun von Fernwald (C.): Ueber die Salubritäts-verhältnisse an der Wiener I. geburts-hilflichen Klinik für Studierende in ihren Beziehungen zur Antisepsis während 29 Jahren. *Wiener Med. Wochenschr.*, No. 35, 1886.—Campbell (W.): *A Treatise on the Epidemic of Puerperal Fever in Edinburgh: with Appendix*, containing the Essay of the late Dr. Gordon on the Puerperal Fever of Aberdeen, 1789-92. Edinb., 1822.—Cheyne (W. W.): Lectures on Suppuration and Septic Diseases, delivered at the Royal College of Surgeons. *BRIT. MED. JOURN.*, February 25th, March 3rd and 10th, 1888.—Dakin (W. R.): On Mercurialisation in Lying-in Women undergoing Sublimate Irrigation. *Trans. Obst. Soc. Lond.*, vol. xxviii, pp. 281 *et seq.* (see also discussion).—Dohrn (R.): Zur Kenntniss der Mortalität in den öffentlichen Entbindungsanstalten Deutschlands während des Decenniums, 1874-83. *Zeitschr. für Geburtshilfe und Gynäkologie*, Bd. xii, Stuttgart, 1886, pp. 121 *et seq.*—Duncan (J. Matthews): *On the Mortality of Childbed*. Edinb., 1870.—Duncan (J. Matthews): *On the Alleged Occasional Epi-*

demic Prevalence of Puerperal Pyæmia or Puerperal Fever, and of Erysipelas. Edinb., 1876.—Fox (W. Tilbury): *Puerperal Fever*. *Trans. Obstet. Soc. Lond.*, vol. iii, for 1861, p. 368.—Galabin (A. L.): The Hunterian Oration on the Etiology of Puerperal Fever. *BRIT. MED. JOURN.*, vol. i, 1887, p. 419.—Hirsch (Aug.): *Handbook of Geographical and Historical Pathology*. Translated by C. Creighton. New Syd. Soc., vol. ii, 1885, pp. 416, *et seq.*—Jamieson (Jas.): Childbirth Mortality in the Australian Colonies. *Austral. Med. Journ.*, October 15th, 1887.—Kücher (Jos.): *Puerperal Convalescence and the Diseases of the Puerperal Period*. New York, 1886.—Leopold: Zur Verhütung des Kindbettfiebers. Separatabdruck aus der *Deutschen Med. Wochenschr.*, No. 25, 1887.—Leopold: Weiterer Beitrag zur Verhütung des Kindbettfiebers. Separatabdruck aus der *Deutschen Med. Wochenschr.*, No. 20, 1888.—Lusk (W. T.): *The Science and Art of Midwifery*. Lond., 1885. Chap. 35 and 36.—Macan (A. V.): Report of the Rotunda Hospital for 1883. Repr. from *Dub. Journ. Med. Science*, June, 1884.—Playfair (W. S.): The Prevention of Puerperal Fever. *BRIT. MED. JOURN.*, vol. ii, 1887, pp. 1034, *et seq.* (See also discussion).—Priestley (W. O.): Notes of a Visit to some of the Lying-in Hospitals of the North of Europe; and particularly on the Advantages of the Antiseptic System in Obstetric Practice. *Trans. Obst. Soc. Lond.*, vol. xxvii. Lond., 1886, pp. 197, *et seq.* (See also discussion).—Richardson (W. L.): The Use of Antiseptics in Obstetric Practice. *Boston Med. and Surg. Journ.*, January 27th, 1887.—Robertson (J.): *Essays and Notes on the Physiology and Diseases of Women, and on Practical Midwifery*. Lond., 1851, p. 439.—Simpson (J. Y.): *Obstetric Memoirs and Contributions*, vol. ii. Edinb., 1856, pp. 1, *et seq.*—Sinclair (W. J.): The Bacteriology of the Female Genital Canal, and Its Practical Import. A review of papers by Goenner, Winter, Döderlein, von Ott, and Steffek. *Med. Chronicle*, vol. viii. Manch., 1888, pp. 493, *et seq.*—Spiegelberg (O.): Antisepsis in der Geburtshilfe. *Trans. Intern. Med. Congress*. Lond., 1881. Vol. iv, p. 386. (See also discussion).—Tarnier (S.): Faculté de Médecine de Paris: Leçon d'Ouverture (Maternity Hospitals). *Ann. de Gynéc.* Paris, 1884, xxi, 241, *et seq.* See abstract *Med. Chron.*, vol. i. Manch., 1884-5, p. 206.—Thorburn (J.): *On Metria, and on the Dual Clinical Characteristics of Metrial Blood-Poisoning*. Manch., 1881.—Wells (T. Spencer): Relation of Puerperal Fever to the Infective Diseases and Pyæmia. *Trans. Obst. Soc. Lond.*, vol. xvii. Lond., 1876, pp. 90, *et seq.* (See also discussion.)

AN ADDRESS

ON

MEDICAL EDUCATION AND THE DUTY OF THE COMMUNITY WITH REGARD TO IT.

Being a Report of an Introductory Address, Delivered at the Opening of the New Buildings of the Sheffield Medical School.

By SIR ANDREW CLARK, BART., M.D., F.R.S.,

President of the Royal College of Physicians, and Consulting Physician to the London Hospital.

I SUPPOSE that, next to the mere act of energising for its own sake, there is no higher and truer pleasure in life than the achievement of a laudable object towards which the energies of some persons or some community of persons have been for a season seriously bent. This pleasure to-night is yours; and, were it not for the indisposition of the venerable man who for so many years has lived and laboured amongst you, this pleasure would have been unalloyed as well as great. The task which you were undertaking when I had the privilege of addressing you a year or two ago is finished. The Medical School of Sheffield, rebuilt, fitted and furnished according to the best experience of the time, resumes on Monday its former work; and we have assembled here to-night to crown this high endeavour, to inaugurate the business of the session, and to give voice to our wish that in its renewed life the school may have a useful, prosperous, and high career.

I congratulate you cordially upon this important and memorable occasion, so worthy of the best traditions of Sheffield, and so

⁹ Holmes (O. W.): The Contagiousness of Puerperal Fever. *New England Journal of Medicine and Surgery*, April, 1843. Reprinted in a pamphlet entitled *Puerperal Fever as a Private Pestilence*, Boston, 1855. Also in *Medical Essays*, 1842-82. Boston, 1883.