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THE TRUTH
ABOUT VACCINATION

AN EXAMINATION AND REFUTATION OF THE
ASSERTIONS OF THE ANTI-VACCINATORS

BY

ERNEST HART

CHAIRMAN OF THE PARLIAMENTARY BILLS COMMITTEE OF
THE BRITISH MEDICAL ASSOCIATION
CHAIRMAN OF THE COUNCIL OF THE NATIONAL HEALTH SOCIETY

LONDON
SMITH, ELDER, & CO., 15 WATERLOO PLACE
1880

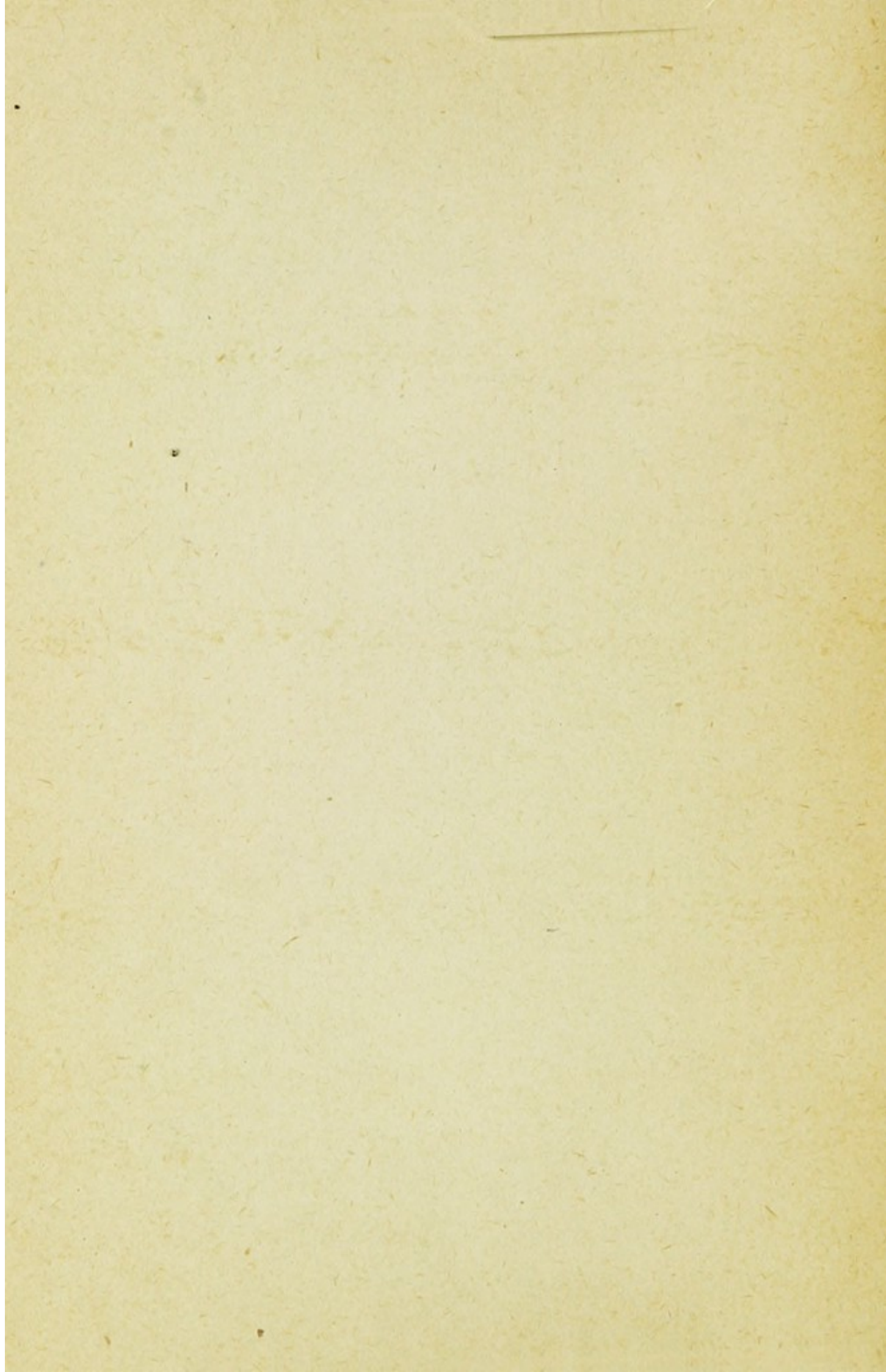
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DEDICATED TO

JOHN SIMON, Esq., C.B., D.C.L., F.R.S.

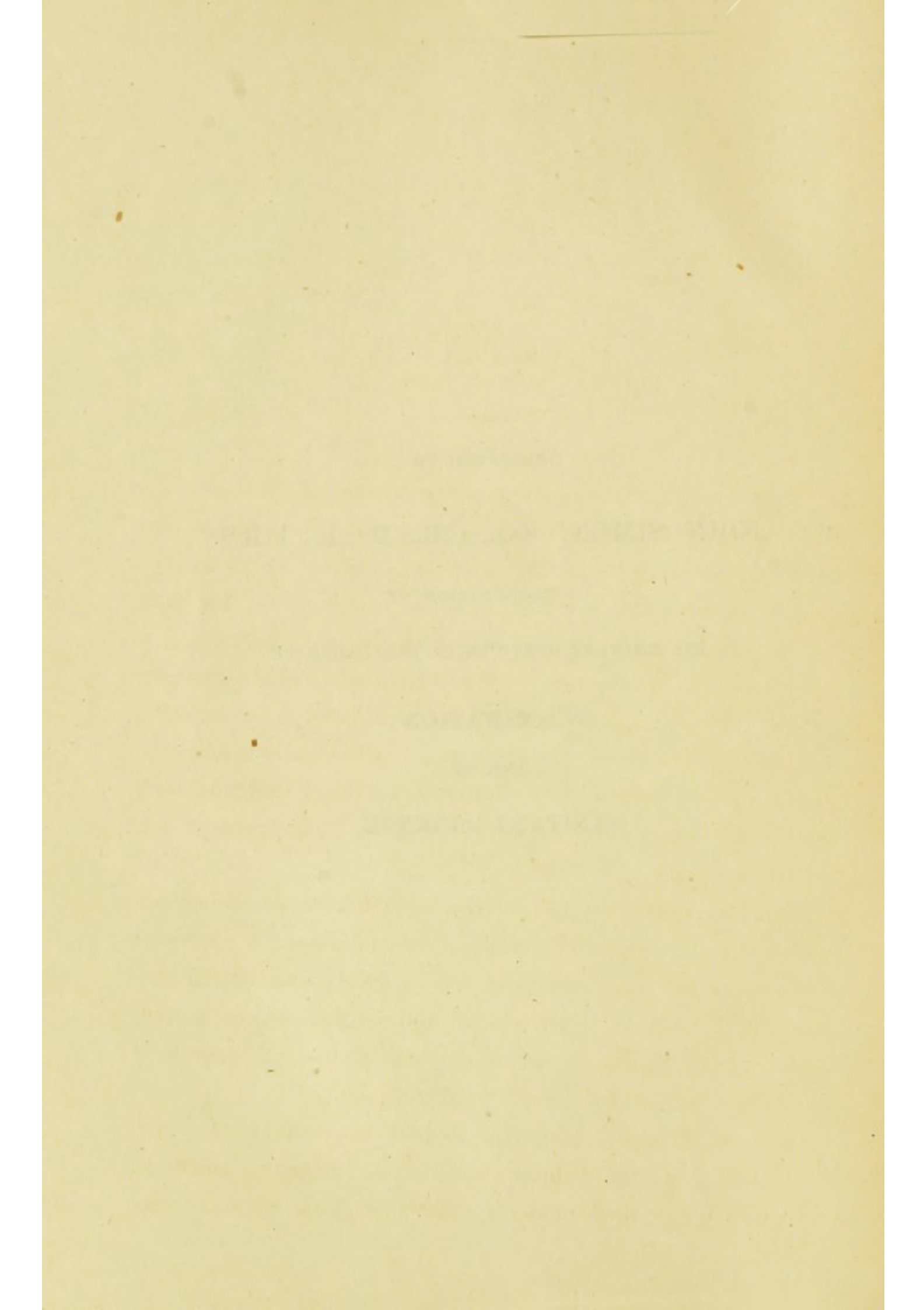
IN RECOGNITION OF

HIS EMINENT SERVICES IN THE CAUSE OF

VACCINATION

AND OF

SANITARY SCIENCE



PREFACE.

IT SEEMS needful to explain in a few words the circumstances under which this pamphlet comes to be published. I have for several years past been frequently appealed to, by all sorts of people, on all sorts of occasions, for a statement of the facts which would enable them to answer the strong assertions of a certain class of agitators who describe themselves as anti-vaccinators. These gentlemen are so very persistent in their agitation, and so elaborately wrong in their statistics and arguments, that it has really become a matter of no small difficulty for a technically uninstructed person to examine their figures or test their allegations.

On the occasion of two of the most recent parliamentary elections, I was hurriedly applied to by candidates for references to the sources from which to answer their anti-vaccinating persecutors. Members of Parliament and magistrates are, indeed, often at their wits' ends to know where to find the true facts which these gentlemen delight to misrepresent.

I have, of course, been able to refer enquirers to the standard works on the subject, and to the Registrar-General's statistics ; but a need evidently exists for some more concise

statement of the merits of vaccination, which will obviate the necessity of individual research into the evidence in its favour. As a matter of fact, I have not been able to refer my enquirers to any such statement, and it seemed to me, therefore, that there would be great advantage in the truth about vaccination being placed before the public in a handy and readily accessible form, so as to supply the materials for an answer to the numerous objections of the anti-vaccinators. Under these circumstances I consented, at the request of the National Health Society, to deliver a public lecture on the subject. This lecture was given at the Hall of the Society of Arts, on the 27th of January last, and is now, in compliance with very numerous requests, printed (with considerable additions) in the present pamphlet.

If there be any merits in the following pages, they must necessarily (from the nature of my task) be due to the excellent material I have had at my disposal. The facts as to vaccination have been so exhaustively treated in the standard authorities on the subject, that judicious selection only is needed to produce irresistible evidence in favour of vaccination. What I have striven to do is to confront the strong and positive statements of the anti-vaccinators with the experience of the eminent men (amongst whom I must especially name Mr. Simon, Dr. Seaton, and Mr. Marson) who have devoted themselves to the study of vaccination in its various aspects.

In cases, indeed, where an important principle was involved, I have not hesitated to quote the exact words of these gentlemen, rather than to attempt to paraphrase their statements in language of my own. In this respect I have largely laid under contribution that 'masterpiece of medical essay-writing,' the

famous 'Papers relating to the History and Practice of Vaccination,' laid before the General Board of Health in 1857, by Mr. John Simon, and the late Dr. Seaton's standard 'Hand-book of Vaccination.' I am indebted also for many of my facts to the Report of the Select Committee of the House of Commons on the Vaccination Act of 1867, and to Dr. Seaton's Report on the Small-pox Epidemic of 1871-2, published in the Fourth of the New Series of Reports of the Medical Officer of the Privy Council and Local Government Board.

The facts which I have given do not, therefore, rest on my assertion alone, but on the matured experience of the recognised leaders of the medical profession on this important question. To compare the value of their evidence in favour of vaccination with the wild and reckless denunciations of the anti-vaccinators, must be wholly superfluous. The facts which I have collected speak for themselves, and I prefer to leave the result to the calm judgment of all impartial persons.

ERNEST HART.

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THE TRUTH ABOUT VACCINATION.

CHAPTER I.

SMALL-POX UNCONTROLLED BY VACCINATION.

1. Introductory.—The literature for and against vaccination is very extensive; but it is not a little curious to observe how differently it is diffused. Whilst ‘anti-vaccinators’ have two or more journals of their own, brimful of most astounding misrepresentations and perversions of facts, together with an extremely energetic system of distributing tracts, inflammatory postcards, grotesquely drawn envelopes, and other means of disseminating their views, there is nothing on the other side in the nature of an accessible antidote to these productions.

The evidences in favour of vaccination are overwhelming: but they are for the most part scattered about in books not readily available, as in the Registrar-General’s annual volumes, and in official and hospital reports, to which the general public have no immediate access. To bring these within reach of the ordinary reader, and to show the fallacy of the arguments of the anti-vaccinators, is the design of the following pages. It is not easy to discover what are the real objections of the opponents to vaccination, as they are so mixed up with side issues that it is often impossible to make out exactly what is being contended for. With the view, however, of doing what I could in this direction, I have taken upon myself the weary task of reading carefully an entire volume of anti-vaccination

tracts, one of many which have been sent to me by the apostles of the cause. For gross misrepresentations, perversions, misquotations, and inaccuracies, and as a medley of utterly wrong and absurd ideas about pathology and physiology, I have never seen their equal. Yet it must be remembered that these tracts are circulated industriously and persistently amongst the classes who are least able to judge for themselves. Uninstructed people, rich and poor, receiving one of such tracts, and incapable of perceiving the fallacy of its arguments or the nonsense of its pathology, are imbued with dangerous prejudices. Presently I shall have occasion to show by what artifices and errors a belief in injury from vaccination is fostered and encouraged, and I, therefore, here, at the outset, only express my firm belief that the opposition to vaccination which is being manifested in certain parts of the kingdom is almost entirely due to the mischief done by these inaccurate, misleading, and bombastic tracts.

It has, perhaps, been too much the fashion to ignore the statements of the anti-vaccinators completely, and to make no attempt whatever to answer them. This course would be quite in accordance with my own personal predilections, but, having recently been led in another capacity to take some public responsibilities in moving for certain improvements of our national system of vaccination, it has appeared to me that it is in a measure a duty imposed upon me to take up the glove thrown down by the anti-vaccinators, and, however reluctantly, to descend into their arena, and strike a blow for reason, truth, and the welfare of the state.

2. Small-pox in its natural state.—First let me draw attention for a short time to what small-pox in its natural state really is, and to what therefore we might have expected from its ravages were it still unmodified by a national system of vaccination, such as that which happily exists in the country of Jenner. At the present time, when small-pox has ceased to be a fatal disease amongst the upper classes of society, there is a temptation for us to forget how our grandfathers and grand-

mothers regarded it. Hence the very success of vaccination may possibly have blinded people to its importance. 'It is so easy to be bold against an absent danger, to despise the antidote whilst one has no painful experience of the bane.' Yet, apart from historical records, our present experience of the nature of the disease might almost enable us to construct a description of the course which it has run. In its natural state we know that small-pox is fatal to a very large proportion of those whom it attacks; that it is eminently infectious from person to person, and that it seizes, with very few exceptions, all who for the first time come within its ravages.

3. Amongst remote communities.—In this way it is easy to explain the fearful havoc which is recorded to have been caused by it in remote or island populations having but little intercourse with busier communities. Here such an infection would come seldom; but, having come, it would find perhaps a whole generation ready to receive it. 'None of the population would have received exemption by having suffered in a former epidemic; and the disease, under such circumstances, must have ravaged more fiercely than the most ruthless of human wars.'¹ In every country, probably its first invasion has been of this kind; and its recurrences, when far apart, have been of equal malignity. Thus it was that in 1518 it helped to complete the depopulation of St. Domingo, which fire, sword, and famine had begun, and that soon afterwards, in Mexico, it even surpassed the cruelties of conquest, suddenly smiting down three and a half millions of population, and leaving none to bury them. Mr. Prescott, in his 'Conquest of Mexico,' quotes from Sahagun's 'History' the following words: '*No habia quien los enterrasse*;' and he also describes the epidemic as 'sweeping

¹ Simon, *Papers relating to the History and Practice of Vaccination*, 1857. This invaluable Blue Book has for a long time been out of print, but its essential parts have been since reproduced in the 'Report of the Select Committee of the House of Commons on the Vaccination Act of 1867' (Parliamentary Paper, No. 246, of 1871), a report which contains a vast amount of information, and should be in the hands of every one interested in the subject of vaccination.

over the land like fire over the prairies, smiting down prince and peasant, and leaving its path strewn with the dead bodies of the natives, who' (in the strong language of a contemporary) 'perished in heaps like cattle stricken with the murrain.' In the same way small-pox, in the year 1563, extirpated in Brazil whole races of men; and, about the same period, in the single province of Quito (according to De la Condamine), it destroyed upwards of 100,000 Indians. Thus, too, in later days, Siberia and Kamschatka,¹ Greenland and Iceland, have been ravaged. Exactly the same state of affairs is found in unvaccinated communities in the present day. I might cite very many instances of this kind, but will content myself with two or three of the most recent.

At the town of Brunei in Borneo, upwards of 4,000 persons were, in a very few months, at the end of 1872 and beginning of 1873, swept off by small-pox in a population of about 35,000 (Despatch from Consul-General Bulwer, February 27, 1873). On the Gold Coast in 1871, small-pox is described by Acting Administrator Salmon as decimating the population. 'Nothing,' says he, 'but the active interference of the local government could have saved the people from annihilation.' (Despatch, January 3, 1872.) Mr. Ashbury, the senior member of Parliament for Brighton, in the course of a recent yachting cruise, visited the sea-port town of Ceara, in the Brazils. Finding that an epidemic of small-pox had recently partially depopulated the town, Mr. Ashbury inquired into the facts. He found that, in one cemetery alone, the burials of persons dead of small-pox amounted to 27,064 from August 1878 to June 1879. In December 1878, no fewer than 14,375 persons who had died of small-pox were buried in this cemetery; and one day as many as 812 such persons were interred. He had not time to obtain the official returns from the other cemetery;

¹ Captain Cook, in his *Voyage to the Pacific Ocean*, speaks of the small-pox, at its first appearance (1767) in Kamschatka, as 'marking its progress with ravages not less dreadful than the plague,' and seeming to threaten 'their entire extirpation.'

but he was informed, on good authority, that the burials there during the same period were about 13,000. Thus, out of a population not exceeding 70,000 persons, no fewer than 40,000 deaths from small-pox had taken place. The United States consul at Tamatave, Madagascar, reports that small-pox, three and a half years ago, swept the eastern coast of the island, carrying off 800 persons in Tamatave alone within the space of two months, attacking all who had not had the disease or were not protected by vaccination, and only disappearing when it had no more subjects to feed upon. The disease was almost entirely confined to the natives, the foreign residents being generally protected by vaccination.

4. Amongst the Indians.—To conceive a vivid idea of the horrors of small-pox, we must see it at work amongst a tribe of savages, as many missionaries and travellers have done. Striking accounts of its ravages amongst the North American Indians in very recent times may be gathered from Mr. Catlin's 'Lectures and Notes on the Manners, Customs, and Condition of the North American Indians.' In one place, Mr. Catlin observes, 'Thirty millions of white men are now scuffling for the goods and luxuries of life over the bones and ashes of twelve millions of red men, six millions of whom have fallen victims to the small-pox, and the remainder to the sword, the bayonet, or whisky.' And in another place he adds, 'I would venture the assertion, from books that I have searched, and from other evidence, that of the numerous tribes that have already disappeared, and of those that have been traded with, quite to the Rocky Mountains, each one has had this exotic disease in their turn, and in a few months have lost one-half or more of their members.' Washington Irving's 'Astoria' also makes mention of several dreadful outbreaks, in which 'almost entire tribes' have been destroyed. And this is what Alexander Mackenzie says of the disease amongst the Indians:—'It was as a fire consuming the dry grass of the field. The infection spread with a rapidity which no flight could escape, and with a fatal effect which nothing could resist. It destroyed with its pesti-

lential breath whole families and tribes.' After picturing the scenes presented by the dead and dying, and the putrid carcasses dragged out of the huts by the wolves, or mangled inside by the dogs feasting on the disfigured remains of their masters, he finishes by telling us that it was not uncommon for the father of a family, whom the infection had not reached, to call them round him, to represent the cruel sufferings and horrid fate of their relations from the influence of some evil spirit who was preparing to extirpate their race, and to incite them to baffle death, with all its horrors, by their own poniards. At the same time, if their hearts failed them in this necessary act, he was himself ready to perform the deed of mercy with his own hand, as the last act of his affection, and instantly to follow them to the common place of rest and refuge from human evil.¹

5. In civilised Europe.—While such was small-pox in the less travelled parts of the world, it seems certain that in civilised Europe, with its constant intercourse of towns and countries, the disease was at least as deadly. Its strength, indeed, was differently distributed. Instead of coming after long absence on masses of population entirely unprotected against the infection, it recurred in each place so frequently that, for the most part, at any given moment, a more or less considerable majority of the inhabitants would have faced the danger before. They would have obtained against its attacks that protective exemption which was generally the good fortune of survivors. But it is a moderate computation, that for every five persons thus, at the price of much past suffering, almost secured against the disease, one at least must have died.² The annual ravages of small-pox in Europe alone have been estimated at half a million of lives. M. de la Condamine reckoned that in France a tenth of the deaths were by small-pox; Rosen's estimate of Sweden was to the same effect.

6. In England.—For our English experience there exist only

¹ Dr. Guy's *Lectures on Public Health*, vol. i. p. 195.

² Simon, 'Papers, &c.,' Report of Vaccination Committee, p. 344.

imperfect records ; but it seems that, within the London Bills of Mortality, small-pox, when not at its worst, averaged a fourteenth of the annual total of deaths ; a fourteenth, too, at times when that total, as compared with the population, represented perhaps double our present death-rate. In England, according to the calculation of Dr. Lettsom, the average annual deaths from small-pox were about 3,000 out of every million of the population,¹ a death-rate which, with the present population of the kingdom, would give an average of about 70,000 deaths from small-pox a year. Nearly one-tenth part of all the persons who died in London within the Bills of Mortality during the last half of last century died of this one cause. The younger part of the population were peculiarly its victims ; in some of our great cities it was found that, on an average of long series of years, nearly, or more than, one-third of all the deaths which took place in children under ten years of age, arose from small-pox.

7. In royal families.—For a striking and suggestive illustration of the disease, it may be enough to point to what it did in royal families. In the family of William the Third for example, his father and mother died of it, his wife, his uncle, the Duke of Gloucester, and his cousins, the eldest son and the youngest daughter of James the Second. He himself (like his friend Bentinck) had suffered from it most severely, barely surviving, with a constitution damaged for life.² Or again, in the Court of Austria : ‘ Joseph the First was carried off, when not more than thirty-three years of age, by the small-pox ; to which in the course of the eighteenth century, besides him, two empresses, six archdukes and archduchesses, an Elector of Saxony, and the last Elector of Bavaria, fell victims.’ To this list might be added many other names ; among them, for instance,

¹ A calculation, separately made by Sir Gilbert Blane, corresponded very closely with Dr. Lettsom’s. (See ‘The Evidence at Large, as laid before the House of Commons,’ &c. By the Rev. G. C. Jenner.)

² Burnet (*History of William and Mary*) says of him, ‘he was always asthmatical, and, the dregs of the small-pox falling on his lungs, he had a constant deep cough.’

a dauphin (1711) and a king (1774) of France,¹ a queen (1741) of Sweden, and an emperor (1727) of Russia. It would be thought a terror-striking epidemic nowadays, that should slay like this in high places.

The same tale would have to be told from the records of noble families. Extensive fatality of any particular disease in single families can of course rarely be known, except when the house is of historical importance; but the same sort of thing as is described above must have been frequent in all classes of society. In one of Horace Walpole's letters (April 2, 1750) we read: 'Lord Dalkeith is dead of the small-pox in three days. It is so dreadfully fatal in his family that, besides several uncles and aunts, his eldest boy died of it last year, and his only brother, who was ill but three days, putrefied so fast that his limbs fell off as they lifted his body into the coffin.'

8. Effects of small-pox on survivors.—The ravages of small-pox are not, however, half enumerated in the list of the myriads whom it killed. From the earliest to the latest records of the disease, there is constant mention of the tax which it levied upon survivors. The eloquent passage in which Macaulay² refers to this, when comparing the ravages made by small-pox in this country towards the close of the seventeenth century, with those of the plague, is well known. Our great historian justly assigned to small-pox the foremost place, as 'the most terrible of all the ministers of death.' 'The havoc of the plague,' says he, 'had been far more rapid, but the plague had visited our shores only once or twice within living memory. The small-pox was always present, filling the churchyards with corpses, leaving in those whose lives it spared the hideous traces of its power, turning the babe into a changeling at which the

¹ The universal terror of the disease is well shown by St. Simon, who, in writing of the Grand Dauphin's death, speaks of Mdlle. de La Vallière being the only one who, not having abandoned him during his life, did not abandon him after his death, and adds, 'Il eut peine à trouver quelqu'un pour aller chercher des Capucins pour venir prier Dieu auprès du corps.'

² *History of England*, vol. iv. p. 530.

mother shuddered, and making the eyes and cheeks of the betrothed maiden objects of horror to the lover.' This description applied with at least equal force a hundred years later. Few indeed, then, were those who were not at some time or other of their lives attacked by this fell disease ; and happy was it for any one so attacked that he should escape with unimpaired health or without serious disfigurement. Among those who outlive it (says De la Condamine) many either totally or partly lose their sight or hearing ; many are left consumptive, weakly, sickly, or maimed, many are disfigured for life by horrid scars, and become shocking objects to those who approach them.¹ Sir Gilbert Blane,² at a later period, quoted a report of the Hospital for the Indigent Blind, to the effect that two-thirds of those who applied there for relief had lost their sight by small-pox.

9. The introduction of inoculation and of vaccination.—Such was the state of affairs when a rumour came from the East that by receiving small-pox of one's own accord, the susceptibility to contract it could be exhausted by artificial means, giving indeed the disease, but so mildly, that there was hardly any danger in the process. Of this method of inoculation, of the objections to it, and of the discovery of vaccination by Jenner, it is beyond my present purpose to speak, but it may, cursorily, be pointed out that to the present time it remains one of the most interesting and least explained facts in pathology, that the specific contagion or ferment of small-pox, so uncontrollable in its operations when it enters a man in the ordinary way by his breathing an infected atmosphere, becomes for the most part disarmed of its virulence when it is artificially introduced to the system through a puncture of the skin ; so that a person exposed to this artificial infection very generally contracts the disease in its mildest and most tractable form. Equally strange and inexplicable is the further and greater change which this ferment undergoes in passing through the

¹ Seaton, *Handbook of Vaccination* (Macmillan, 1868), p. 189.

² *Medico-Chirurgical Transactions*, vol. x. p. 326.

tissues of the cow : a change which renders it incapable, when retransmitted to the human system, of any longer propagating itself by effluvia, while it retains its capability of propagation by subcutaneous introduction, and its power of protecting the system by its own further action upon it.¹

10. What vaccination is. Jenner's opinion.—Having thus attempted to show what uncontrolled small-pox is, it behoves me to say a few words as to what vaccination is, and what it professes to do. There is in my mind very little doubt that human small-pox and cow-pox are derived from one and the same infection : the differences in their effects being as just stated. Which is the ancestor of the other is a moot point at present, into which it would hardly be profitable for me here to enter : but that small-pox and cow-pox are identical was Jenner's firm belief.

The protection, therefore, which vaccination would afford against small-pox was held by Jenner to be exactly that—neither more nor less—which an attack of small-pox, either taken naturally or induced by a completely successful inoculation, would confer against a subsequent attack of the same disease. Whatever phrase may be picked out of his writings here and there, to show that he looked on the security which cow-pox would impart against small-pox as absolute, that he believed that the human system which had once felt genuine cow-pox was 'never afterwards, at any period of its existence, assailable by small-pox,' must be read with this limitation. The system of a person who had been vaccinated was regarded by him as having already passed through small-pox, and as being so far as regards future small-pox exactly in the condition of a person who had had small-pox in the ordinary way. And as he was well aware, and indeed constantly urged, that the small-pox itself did in some individuals recur, and that the having passed through one attack was not, in every instance, a security against a future attack, so he looked for similar occurrences after vaccination. What, in short, he really claimed for

¹ Seaton, *Handbook*, p. 193.

vaccination is thus stated by him: 'Duly and efficiently performed' (for this, of course, was indispensable), 'it will protect the constitution from subsequent attacks of small-pox as much as that disease itself will. I never expected it would do more, and it will not, I believe, do less.'¹

11. The power of vaccination in influencing small-pox.—Eighty years' use of vaccination has proved beyond doubt that, 'duly and efficiently performed,' its power of influencing small-pox is, indeed, almost absolute, that it acts, not invariably by preventing, but sometimes only by controlling that disease. The vast majority of those who have gone regularly through the vaccine process are saved thereby from any future attack, however modified or slight, of small-pox. In the minority, who have not been rendered by it completely proof against the influence of the small-pox poison, the action of that virus is yet so modified that the small-pox, as a rule, is deprived of all danger to life, and does not leave behind it those disfiguring traces which are not the least of the terrors of unmodified variola. There is certainly no subject on which medical testimony is more unanimous than on the very large immunity from attacks of small-pox which successful vaccination will confer. A vast body of evidence which was collected by the Epidemiological Society in 1851-52, from all parts of the kingdom and from abroad, showed that vaccinated persons placed in circumstances in which no unvaccinated or otherwise unprotected person, or scarcely any such, escaped (*e.g.* persons living in crowded and ill-ventilated dwellings in which the small-pox infection existed, occupying the same rooms, and sleeping in the same bed with small-pox cases, mothers nursing their babies who were suffering from the disease), yet remained themselves entirely unscathed.

12. Modifying power of vaccination.—The modifying power of vaccination, its power of so altering the course and character of small-pox as to convert it from a disease usually severe, confluent, and in a large proportion of cases fatal, into

¹ Seaton, *Handbook*, p. 198.

a disease for the most part slight, unimportant, and void of danger, is equally well established. The degrees in which small-pox may be modified by vaccination are various, depending on various circumstances, but chiefly, as is shown in the subjoined table, on the way in which the vaccination has been done. Modification does not occur indeed in all cases of post-vaccinal small-pox; in some, particularly where the vaccination has been imperfect, the small-pox is observed to run its usual course.

STATISTICAL EVIDENCE of the different degrees in which persons vaccinated in different ways will be safe against death by small-pox, if they should happen afterwards to contract this disease.

The table is founded on information given to the Medical Officer of the Local Government Board by Mr. Marson, Surgeon of the Small-pox Hospital, as the result of his observations made during twenty-five years in nearly 6,000 cases of post-vaccinal small-pox.

Cases of Small-pox, classified according to the Vaccination-marks borne by each Patient respectively.	Number of Deaths per cent. in each Class respectively
1. Stated to have been vaccinated, but having } no cicatrix	21 $\frac{3}{4}$
2. Having <i>one</i> vaccine cicatrix *	7 $\frac{1}{2}$
3. Having <i>two</i> vaccine cicatrices †	4 $\frac{1}{8}$
4. Having <i>three</i> vaccine cicatrices	1 $\frac{3}{4}$
5. Having <i>four or more</i> cicatrices	$\frac{3}{4}$
Unvaccinated	35 $\frac{1}{2}$

* Among cases in which the one cicatrix was *well marked*, the death-rate was 4 $\frac{1}{4}$. Among cases in which it was *badly marked*, the death-rate was 12.

† Among cases in which the two cicatrices were *well marked*, the death-rate was 2 $\frac{3}{4}$. Among cases in which they were *badly marked*, it was 7 $\frac{1}{4}$.

CHAPTER II.

OBJECTIONS TO VACCINATION.

13. The anti-vaccination creed.—We come now to the consideration of the special anti-vaccination arguments on the other side of this question; and here I find that the chief resource of the anti-vaccinator is a vague generalisation that vaccination has no effect on small-pox, that it is the means of inoculating other diseases into the human system, and that it is an outrage on the freedom of the subject. In the volume of tracts already referred to, I find all sorts of variations of these arguments, but, except in one place, no plain statement of the whole anti-vaccination creed. I have, however, by analysis eliminated the following propositions as the main objections to vaccination expressed and entertained by its opponents:—

‘1. Vaccination introduces matter from diseased animals and children into the blood of healthy children.

‘2. Vaccination is mainly derived from small-pox inoculation of calves and heifers; it is small-poxing. Jennerian vaccination has virtually ceased.

‘3. Vaccination, enforced by law, breaks the law forbidding inoculation.

‘4. Vaccination propagates syphilis, consumption, and hereditary diseases, which appear years afterwards at their appointed times. It produces immediately erysipelas, and aggravates the disorders of childhood; destroying the germs of the teeth during teething. It is especially productive of mesenteric and glandular diseases, and lies at the foundation of the shameful mortality of whooping cough.

‘5. Vaccination intensifies small-pox epidemics; and the more it prevails the greater is the epidemic mortality.

‘6. Vaccination does not mitigate small-pox; for it does not diminish the small-pox death rate.

‘7. Vaccination has no power of preventing small-pox; for nearly everyone who takes small-pox has been vaccinated.

‘8. Vaccination rests on perverted statistics; and directly influences medical authorities to frame such perversions.

‘9. Compulsory vaccination stamps out parental feelings and consciences, and Christian faith and courage, and makes weak parents accomplices in its own wickedness, rotting the social state in its very heart.

‘10. Compulsory vaccination is not law, excepting in the sense in which murderous tyranny is law. It is not medicine, save in so far as consummate blood-poisoning is medicine.

‘11. Resistance to it is a law of nature in unperverted men and women, and a dictate of the law of Christ. Brethren, resist even to martyrdom, and He, the Lord, will defend the right.’

However ridiculous some of these statements may appear, they are nevertheless far less nonsensical and reckless than many others that appear in anti-vaccination publications. I willingly believe that some of the authors are actuated by worthy intentions; but the tracts, for the most part, are so ignorantly and disingenuously written, that it would be a mockery to treat them as belonging to the literature of science or of common sense. That vaccination has produced new, strange, and unheard-of diseases, that it has caused degeneration, mental and physical, of the human species, diminishing men’s stature, incapacitating them for the fatigues of military service or even for the exercise of dancing, and driving them for consolation to tobacco,¹ are assertions that have been very seriously and very vehemently made, but against which it is surely not necessary seriously to argue. Whilst therefore I propose dis-

¹ Verdé de Lisle, *De la Dégénérescence Physique et Morale de l’Espèce Humaine déterminée par le Vaccin*. Paris, 1855.

cussing every substantial statement which has been raised against the practice of vaccination, I cannot profess to deal with mere declamation founded on reckless guesswork.

Of the articles in the anti-vaccination creed, the only ones that need any argument at all are those numbered 1—7. The rest obviously do not require any serious consideration. They are merely the outpouring of the vials of wrath of the anti-vaccinators, and I shall be content with merely quoting them.

14. Alleged introduction of diseased matter.—The first of the objections is a fair sample of those on which the anti-vaccinators rely. That vaccination, as such, ‘introduces the matter of diseased animals and children into the blood of healthy children,’ is a distinct falsehood. So far as a child can be said to be diseased by having the vaccine disease it is of course true : but no vaccinator in his senses would think of taking lymph from a child otherwise diseased for the vaccination of others.¹ The lymph used in vaccinating is the product of the vaccine disease, and can itself no more produce any other disease than cabbages can be raised from acorns.

15. Allegation that ‘vaccination is small-poxing.’—The allegation that ‘vaccination is mainly derived from small-pox inoculation of calves and heifers, that it is therefore small-poxing, and that Jennerian vaccination has virtually ceased,’ (No. 2) is as untenable as the preceding. The notion that ‘vaccination is small-poxing’ is founded on some experiments made by M. Chauveau, at Lyons, some years ago, the fallacy of which has often been exposed. The elaborate experiments of Mr. Ceely, of Aylesbury, have put it beyond a doubt that the infection of human small-pox, in being passed through the cow, undergoes such alteration as deprives it of all malignity

¹ Due compliance with the official instructions to vaccinators under contract, which all public vaccinators in the kingdom are bound under Order of Council to obey, ought to prevent the occurrence of any mischief whatever from the operation of vaccination. The regulations, which are very full and distinct in their terms, will be found reproduced in Appendix A., p. 65.

and of all power of propagating itself among the human species by effluvia. The small-pox of man conveyed to the cow produces cow-pox; but the cow-pox thus induced, retransferred to man, is as incapable as the natural small-pox itself of producing infectious small-pox.¹

What M. Chauveau and his colleagues did, was to inoculate calves with small-pox matter, and then to remove a number of the papules which appeared at the points of inoculation, papules which in the judgment of the greater number of persons to whom they were shown, were regarded as the simple result of inflammatory action round an inoculated point, and as indicative of no specific infection. The inner surface of these papules being well scraped, excessively minute quantities of a serous liquid were got, which, when inoculated on the human subject, reproduced small-pox. The results were regarded by the experimenters as showing that the inoculation of small-pox on cows produces a true variolous infection, and that the organism of the cow is therefore incapable of transforming variola into vaccine. But, as Dr. Seaton has well pointed out,² the local effects produced by these inoculations were not in any respect greater than those produced by Mr. Ceely in cases which he regarded as failures, nor than in cases which the experimenters themselves at first put aside as failures. It is not at all improbable that, if Mr. Ceely had dealt with the tumid papules that arose on the cows as M. Chauveau did, he might have obtained from them the same stuff that was put in, 'stuff which had undergone no sort of transformation whatever, but which had lain where it was put, as in a pouch, quite inert, giving rise only to local irritation without inducing any sort of general affection or disease.' It is important in this connection to note that M. Bouley, having inoculated a cow with variola with the same results as M. Chauveau obtained, vaccinated it afterwards, with the result of

¹ For a very interesting thesis on the Relation of Cow-pox and Horse-pox to Small-pox, see a paper by Dr. Robert Cory, in *St. Thomas's Hospital Reports*, 1879.

² *Handbook*, p. 57.

producing regular cow-pox; and Mr. Ceely, in his variolous experiments on cattle, constantly produced the phenomena described by M. Chauveau, and found subsequent vaccination of these animals, in the great majority of cases, successful. The Lyons experimenters did not, it is true, in the least dispute Mr. Ceely's account of the results he met with, but maintained that what he mistook on the cow for cow-pox vesicles was in reality the variolous eruption; and what he produced on children taken from these vesicles was not, as he imagined, cow-pox at all, but simply inoculated small-pox. It is to be feared that these gentlemen had never had before them the original monograph of Mr. Ceely which deals so ably with this subject.¹ Unfortunately Mr. Ceely's painstaking researches have never been sufficiently known or thoroughly understood. Abroad especially, they are not so well known as they deserve; and as M. Chauveau and his colleagues state in their report that they had not seen Mr. Ceely's 'plates,' it is very likely that they had not seen his report. Dr. Seaton² gives reasons for the opinion that they probably relied for their information on the inaccurate and imperfect account of Mr. Ceely's experiments given in the classical French work on vaccination of M. Bousquet, who, amongst other errors, committed himself to the extravagance that, in England, when children were vaccinated with Mr. Ceely's lymph, 'les premiers n'ont eu qu'une éruption locale; mais, en poursuivant les expériences, il s'en est trouvé qui ont eu une variole complète, tellement que l'autorité a fait défense de communiquer ce virus, et a puni une infraction de 300 fr. d'amende.' Perhaps this extraordinary statement, for which it need scarcely be said there is not the slightest foundation, may have helped to mislead M. Chauveau and his colleagues. Certainly, if M. Chauveau and his colleagues had seen Mr. Ceely's plates, they would have learnt that their own local results on cattle had been quite well known in this country twenty-five years previously.

¹ *Transactions of the Provincial Medical and Surgical Association* vol. viii.

² *Handbook*, p. 60.

Many tens of thousands of persons in England have been vaccinated by various hands with lymph generated by passing small-pox through the cow, and thus producing cow-pox. Mr. Badcock, of Brighton, who, with Mr. Ceely, has been successful in variolating kine, has himself vaccinated upwards of 20,000 persons with it, so that its properties are established on a scale far too considerable for question. It is sufficient to refer to the fact that for forty years some hundreds of practitioners have been using this lymph without one single case of infection being recorded as following its use, such as must have inevitably occurred in thousands of instances if this lymph had been small-pox lymph.¹

16. Real source of the chief part of the lymph in present use.—As to the statement that ‘vaccination is mainly derived from small-pox inoculation of calves and heifers, and that Jennerian vaccination has virtually ceased,’ it is to be observed that it is extremely rare to succeed in the variolation of kine, Mr. Ceely succeeding only twice out of a large number of experiments, Mr. Badcock’s success being only seven per cent. of trials, and a recent series of experiments conducted under Government authority and the highest scientific sanction, having failed altogether. It is, therefore, quite a fallacy to suppose that vaccine is mainly derived from this source. As a matter of fact, the lymph propagated at the vaccination stations in England supplying the National Vaccine Establishment, which sends lymph all over the country for vaccination purposes, is

¹ A case which forcibly illustrates the mischief caused by the dissemination of doctrines such as these came before the Queen’s Bench Division of the High Court of Justice recently. It was seriously argued that the conviction of a person under Section 31 of the Vaccination Act of 1867 was bad, ‘as being contrary to the next section of the Act, Section 32, which says that any person who shall communicate small-pox shall be deemed to commit an offence.’ Mr. Justice Lush, when it was explained that the argument was that vaccination is a communication of the small-pox, at once said that the Court could not listen to such an objection, and dismissed the application. (*Times*, Feb. 27, 1880.)

nearly all of the old Jennerian stock; and we have the deliberate statement of Dr. Seaton, the highest modern authority on the subject, that from daily opportunities of observation, he could affirm that it has not lost any of its infective power, and that the vesicles produced by it correspond accurately in their character and course with Jenner's description.¹

17. Allegation that vaccination breaks the law forbidding inoculation.—This absurdity is disposed of by what precedes. The 'law against inoculation' is a penalty for inoculating any person with small-pox, because of the danger of spreading that disease by creating fresh foci of contagion. Will anyone contend that contact with or proximity to a vaccinated baby involves a risk of an attack of small-pox, as would necessarily happen if the baby by its vaccination had been inoculated with the small-pox?

¹ *Handbook*, p. 180.

CHAPTER III.

ALLEGED MISCHIEF FROM VACCINATION, AND INCREASED
MORTALITY FROM CERTAIN DISEASES.

18. Allegation that vaccination propagates syphilis, consumption, and hereditary diseases; that it produces erysipelas, and aggravates the disorders of childhood.—This objection (No. 4) is, of course, the most serious of all, and will need the greatest amount of attention. I pass over the utterly absurd statement that vaccination ‘lies at the foundation of the shameful mortality from whooping cough.’ One might as well say that it caused chilblains, or lay at the root of the Afghan war.

Undoubtedly, as to alleged incidental evils of vaccination, there are questions which may reasonably be asked. The eighty years’ experience which has established the merits of vaccination—has it shown any countervailing harm? Have vaccinated persons, in acquiring their insusceptibility to small-pox, become more susceptible to any other disease? Has anything tended to show that vaccination, however perfect for its purposes, is in other respects a disadvantage?

19. Source of fallacy to be guarded against.—In proceeding to investigate this matter, there is, first, a source of fallacy to be guarded against. Those millions whom vaccination saves from one kind of premature death, must, of course, die eventually. Susceptibility to small-pox is a very definite state of body; equally definite and distinct are the susceptibilities to other specific diseases; and it has never been pretended that man becomes less susceptible of one because he is less susceptible of the others. Vaccination is directed against

the one susceptibility only ; and a child whose liability to small-pox has just been extinguished by well-performed vaccination, may to-morrow, like an unvaccinated child, be run over, or be drowned, or sicken of measles, or suffer with teething, or be struck with any other of the numberless shafts of death. The vaccinated subject advancing to adolescence, or mid-life, or to old age, must encounter, like the unvaccinated, the several risks of each period of life. And obviously, if vaccination on a given day in England secures a thousand lives against death by small-pox, sooner or later those lives will be subject to the inevitable lot ; sooner or later the thousand deaths will be written against the names of other diseases than small-pox ; and such diseases may then be said to have been rendered more frequent by vaccination. In the same sense every life that is snatched from fire, or flood, or poison, counts at last as a death from some other cause ; and to say in *this* sense that such causes are more fatal than before vaccination, is but another form of saying, what Jenner would most have wished to hear, that small-pox is less fatal than it was.¹ Vaccination does not profess to make mankind immortal ; it tends to save from small-pox and its sequelæ, and from nothing else, and everybody whom it so saves lives to die another day of some other disease. To make the objection of any value, it would need to be shown that vaccination, either by some positive action of its own, or by depriving the constitution of some advantages consequent on having small-pox, leaves it *more prone* than it would otherwise be to take on other diseases, and more prone to such a degree as to counterpoise the saving of life and health involved in keeping off small-pox.

20. Allegation that vaccination induces increased mortality from enthetic and constitutional diseases.—The assertions that vaccination is dangerously injurious to the public health, by the propagation of phthisis and other hereditary diseases, and by the causation of erysipelas, which had previously been made on more or less unreliable data, have been made with a greater show of authority since based upon a misleading Parlia-

¹ Simon, 'Papers, &c.,' Report of Vaccination Committee, p. 371.

mentary return asked for in the House of Commons, in May 1877, by Mr. Hopwood, in a form devised to meet the purpose of the requirements of the anti-vaccinators. The return, which was prepared in the Registrar-General's office, contained the mortality under one year of age, and at all ages, from fifteen specified causes, in each of the twenty-nine years 1847-75 (shown in three groups of years), for England generally, and in each registration district which had in 1871 a population exceeding 50,000 persons.

The fifteen causes were:—Atrophy and debility (including premature birth), tabes mesenterica, convulsions, cholera, diarrhœa, diphtheria, bronchitis, pneumonia, whooping cough, erysipelas, pyæmia, skin disease, syphilis, and small-pox. This selection was probably made because vaccination is supposed by those who suggested the return to affect the mortality from these diseases. It is hard, however, to comprehend how, if vaccination affects the mortality from diarrhœa, diphtheria, bronchitis, pneumonia, and whooping cough, it does not affect all other causes of death. The number of deaths referred to bronchitis and diarrhœa have shown a remarkable increase during the 29 years embraced by the return, and, mainly owing to this fact, the total mortality from those fifteen selected causes showed a steady increase both of infant mortality and of the death rate at all ages. The increased mortality from these fifteen causes of death during the period in which compulsory vaccination has been adopted, has been accepted by anti-vaccination agitators as evidence of the fatal effects of vaccination, and on the faith of this violent and imaginative assumption, it is frequently asserted that thousands of lives are annually sacrificed to compulsory vaccination. The return does not show that from other causes of death than those fifteen, there was a decline of mortality, during the period embraced by the return, more than corresponding with the increased mortality from these selected fifteen causes. With regard to infant mortality from all causes, the deaths under one year of age to 1,000 births were equal to 156 per 1,000 previous to the first Compulsory Vaccination Act, declined to 153 per 1,000 between 1854 to 1867, when vaccination was com-

pulsory, and further declined to 152 between 1868 to 1875, when vaccination was more generally enforced. As infant mortality has not increased since vaccination became more general, it is clearly an unwarranted assertion to urge that vaccination has caused a large increase of infant mortality. Taken separately, the recorded fatality of *tabes mesenterica*, diarrhœa, bronchitis, erysipelas, pyæmia, skin disease, and syphilis, has shown an increase in recent years; whereas the fatality of each of the eight other causes has shown a decline. The main increase in the fatality of these selected diseases has been due to bronchitis and diarrhœa, and it would be about as reasonable to attribute this increase to vaccination, as it would be to attribute to that cause the decline of infant mortality from all causes.

It is beyond dispute that the recorded mortality from *enthetic*, erysipelas, and skin disease, has increased in recent years, which is, however, far more than balanced by the decline of the deaths returned under the indefinite headings of convulsions, and atrophy and debility. There is good ground for believing that the increase of deaths referred to these causes is due to greater precision in the diagnosis and certification of fatal diseases, rather than to their actual greater fatality.

21. Comparison of present with past diseases very liable to fallacy.—In fact, the comparison of present with past diseases is one extraordinarily liable to fallacy. Names of disease are constantly varying: not only because the language of physic changes with the general language of the country, but more especially because, as the anatomical and chemical knowledge of disease is extended, nomenclature becomes more precise, and maladies which had been lumped together under one undescriptive name get their several distinctive titles. Our increased vocabulary has been in proportion to the great scientific progress of the last fifty years; it denotes that more distinctive enumeration of disease by anatomical or chemical characters which is due to the labour of the many eminent workers who have developed these studies of medicine.¹

¹ Simon, 'Papers, &c.,' Report of Vaccination Committee, p. 378.

22. Hypothesis that vaccination renders persons more liable to other diseases than small-pox contrary to the whole current of medical experience.—The hypothesis that vaccination by rendering persons less liable to small-pox renders them eventually more liable to other diseases, is indeed contrary to the whole current of medical experience. This was clearly brought out when, in 1856, Mr. Simon, then Medical Officer of the Board of Health, addressed to the heads of the medical profession at home and abroad the question, ‘Have you any reason to believe, or to suspect, that vaccinated persons, in being rendered less susceptible of small-pox, become more susceptible of any other infective disease, or of phthisis, or that their health is in any other way disadvantageously affected?’ Of 542 respondents of great experience, there was not one whose experience gave the slightest support to the hypothesis.

23. Allegation that cutaneous diseases and glandular swellings are invaccinated.—Inasmuch as cutaneous diseases and glandular swellings are frequently noticed in children subsequent to their vaccination, parents are often found to allege that these diseases have been introduced by the vaccination. But this again, though a popular, has never been a professional belief. Diseases of these classes are met with constantly in infancy and childhood, as well in the unvaccinated as in the vaccinated, from the influence of various exciting causes acting on constitutional predisposition. No facts observed by competent authorities exist to prove, or even to render probable, their greater frequency among the vaccinated than among the unvaccinated of the same ages respectively; observation, indeed, tends to show that there is no such greater frequency. When eczematous and other eruptions manifest themselves, as they may do, shortly after vaccination has been performed, this is in fact usually, if not always, mere coincidence; and the eruption on enquiry is found to be really due to the irritation of teething, or probably to some error in diet, or to some general constitutional tendency. It *may* be, however, that in some cases vaccination, by the febrile action it sets up, may act as an *exciting* cause, just as a common

cold would do, and thus be the means of sooner evolving some eruptive disorder that was lurking in the system. But such cases are exceptional; and, certainly, no professional authorities believe in the *transference* of glandular or cutaneous diseases from one child to another by vaccination. Parental complaints of such communication arise, as Mr. Marson very justly states, from the unwillingness of parents 'to believe that there is anything wrong in their offspring; and, when other diseases follow, vaccination gets blamed for what is really and truly due to other causes.' In corroboration of this statement, and as illustrating the want of foundation of such complaints, and the prejudices under which they are preferred, Dr. Seaton has stated that having himself carefully investigated many of them, he has never yet in a single instance found that the child from whom the lymph was taken was suffering from the disease it was said to have imparted.¹

24. Erysipelas after vaccination.—As to erysipelas, it is undoubtedly true that in a small proportion of cases, vaccination, especially if it has taken effect in a hastened or spurious form, will in its course manifest inflammatory symptoms of considerable activity, and very sore arms will result; the vesicle leaving a cicatrix which has none of the characteristic pittings, but is simply a puckering, or a flat, smooth, shining scar. In a still smaller proportion of cases true erysipelas may occur. Often this erysipelas is found to attack one child only amongst several that have been vaccinated with the same lymph, and the cause must then be looked for either in the constitution or habit of body of the child vaccinated, or (so far as erysipelas is concerned) in what Sydenham called the 'constitution of the air.' Accordingly, cases of erysipelas following vaccination, when they do occur, are not unfrequently met with two or three together in one locality, and at times when erysipelas is noticed as attending wounds from other surgical operations, however trifling, even the drawing of a tooth or a scratch with a pin being sometimes sufficient to induce erysi-

¹ *Handbook*, p. 302.

pelas. For these reasons, when erysipelas is prevailing in or about the place of residence, no careful vaccinator should, except of necessity, perform the operation of vaccination. (See Appendix A., Instruction 1., p. 65.)

25. Syphilis after vaccination.—I come now to the most unpleasant subject of all—that of the alleged invaccination of syphilis. It is this supposed danger that, more than anything else, fosters opposition to vaccination. Syphilis differs from any other of the diseases which, it has been alleged, may be propagated by vaccination, in being an inoculable disease; a disease which, in fact, except in the forms in which it manifests itself hereditarily, is always the result of some inoculation. But the inoculation which produces it is the inoculation of its own infection; and, as small-pox produces small-pox, vaccinia vaccinia, and glanders glanders, so does syphilis produce syphilis. The causes of all these and of other inoculable infections are specifically so distinct, that it has always been held by medical authorities in the highest degree improbable that the unmixed inoculable products of any one of them should convey any other infection along with it, and when, after the introduction of small-pox inoculation during the last century, the objection was raised that that process might be the means of conveying syphilis, enlightened medical opinion rejected such a supposition as not sustainable. Whatever this objection might be worth as against small-pox inoculation, it would of course be worth as against vaccination; but in reference to this latter process its value has been tested on an infinitely larger scale, for where small-pox inoculations amounted to thousands, vaccinations have amounted to millions.¹

26. Allegations of invaccination of syphilis may easily be made in cases where there is not even a pretext for them.—It would be quite out of place for me to go on this occasion minutely into the cases of undoubted syphilis after vaccination that have been reported; but in any attempt to discuss the invaccinations of syphilis, it is essential to remember that such

¹ Seaton, *Handbook*, p. 303.

allegations may easily be made, with or without dishonest intention, in cases where there is not even a pretext for them ; and that above all, where such allegations relate to single infections of syphilis, hasty belief in them ought particularly to be avoided. A first reason for caution is this :—‘ When a child is born with the heritage of syphilis (a very frequent incident if its parents have been suffering from that infection) the characteristic symptoms commonly do not appear till some weeks after birth, and then the scandal discloses itself. Now, among persons with any sense of shame, the knowledge that one had transmitted syphilis to one’s child would always be a sore subject. There would be strong temptations to employ false pretexts. Not only would parents often conjointly wish to disguise from their medical attendant, or from members of their household, the real explanation of the child’s ailment ; but also, not infrequently, one parent would wish to conceal from the other that the origin of the disease had been a conjugal infidelity. Accordingly it is a matter for surprise that vaccination has not almost generally been pitched upon by persons in search of an apology for their syphilitic children.’ Another reason for caution, even in cases where the good faith of the accuser is unquestionable, consists in the fact that a simple surgical cut, in a child having latent in it the taint of hereditary syphilis, may proceed by ulceration to assume the ordinary characters, and require the specific treatment, of a syphilitic sore. For, as such is the fact, presumably the same thing might happen at the vaccination punctures of a child having latent constitutional syphilis ; so that, under the operation of the constitutional taint, they, or one of them, though the vaccination had been performed with perfectly pure lymph, would become the seat of syphilitic ulceration ; a phenomenon which, if the parents were disguising the previous facts of the case, might mislead or greatly perplex an observer.¹ Moreover, if

¹ Dr. Channing Neill, of Montpellier House, Ryde, I.W., writing to me on January 24, 1880, gives the following instructive instance in point. He says :—‘ I was called upon lately by my friend and patient,

there are cases where these sources of fallacy do not apply, cases where a person pretending to vaccinate has indubitably inoculated syphilis, it must not, without very critical examination, be assumed that the act which did the mischief was one which could in any reasonable sense be called vaccination, or that any inference from such a case is applicable to the present argument. For in foreign countries attempts have again and again been made to decide by experiment whether vaccination from persons obviously ill with constitutional syphilis will communicate syphilis to the recipient; and it is, to say the least, a very remarkable fact that in not one of these experiments has anything like syphilis resulted.¹

With the well-attested experiments which now stand on record, we are obliged to doubt whether vaccination (i.e. genuine and simple inoculation with vaccine lymph), from however syphilitic a subject, can possibly communicate syphilis; or, at the very least, whether some stage of the vaccine vesicle more advanced than vaccination rules allow to be proper for lymph-
the Rev. —, Roman Catholic priest, who informed me that great agitation was being got up in Newport over a child vaccinated by me, who had developed syphilis; that the child's father went about telling everyone how his baby had been poisoned, and that it was proposed to hold a public meeting. I at once went to Newport and saw the child, which certainly presented characteristic syphilitic symptoms, but I could not find at the points of puncture any evidence of primary sores. I then went to see two other children whom I had vaccinated at the same time, with the same instrument, and lymph out of the same tube, this child having been the last of the three to be vaccinated. I found both these children perfectly healthy, with well-marked cicatrices, and no appearance of specific infection. I then brought the three families together in the presence of the priest; the mothers all agreed that the children were treated exactly alike. In answer to my enquiries I learnt that the mother of the infected child had miscarried twice. There was no doubt that the child had congenital syphilis, probably brought into activity by the vaccination.' Had it not been for Dr. Neill's prompt and energetic enquiry into this case it would doubtless have now been quoted far and wide by the anti-vaccinators. It would be well that every medical man should follow Dr. Neill's example in similar allegations of mischief from vaccination.

¹ *Twelfth Report of the Medical Officer of the Privy Council* (1869).

supply, or some admixture, which careful vaccinators never permit, of blood with the vaccine lymph, must not be a condition for such possibility.

27. Practical and common-sense view of question of vaccino-syphilitic inoculation.—Looking at the matter, then, in a practical and common-sense manner, suppose that there existed risks of vaccino-syphilitic inoculation much greater than there really are, and that the occurrence is one that, under some unknown conditions, might take place in a properly performed and careful vaccination: to what, after all, do these risks amount? Suppose we assume that in all the cases that have been advanced, except those in which on the very face of the story there was manifest malperformance, the vaccination had been properly done, what proportion do these bear to the millions upon millions of vaccinations that have been performed? During the twenty years in which there has been systematic inspection of public vaccination in England, some millions of vaccinations have been performed; but in no single instance have the Government Inspectors of Vaccination been able, after the most rigid enquiry, to find one single case of syphilis after vaccination.

In every case of complaint made to it of injury from vaccination, it is the invariable practice of the Medical Department of the State to make searching enquiry into the validity of the complaint; and in no single instance has the mischief been traced to the use of the lymph employed. Dr. Henry Stevens, to whom, as chief Vaccination Inspector of the Local Government Board, it has fallen to investigate the great majority of such complaints, stated recently at a public conference of medical men, that he had not been able to bring home syphilis to the vaccination in any one case, in the whole of the enquiries and investigations he had made for the Government.¹ Nothing could well be more convincing than this; but nevertheless, any person who imagines his child to have been injured by vaccination has the privilege, if he desires to avail himself of it, of

¹ *British Medical Journal*, December 13, 1879, p. 956.

having the facts thoroughly and impartially investigated by a Government medical official.

‘Either,’ as Mr. Simon has well put it, ‘it is the case that even with reprehensible carelessness as to the source of lymph, vaccination (so long as in any sense of the word it is vaccination), cannot be the means of communicating any second infection; or else it is the case that in the world of vaccinators care is almost universally taken to exclude the possibility of danger.’ The sixty thousand lives which at the least are now, on an average, saved annually from small-pox in England alone, are not gained without here and there a child getting erysipelas from its vaccination, and even, in cases of excessive rarity, dying of it; but what reasonable man would hesitate on account of this risk to have his child vaccinated? Dr. Seaton, whose opinion on this subject is entitled to the greatest possible respect, emphatically declared that the danger, *if indeed there be any at all*, of communicating *through vaccine lymph, as in an ordinary well-performed vaccination*, any other infection than its own, must be so infinitesimally small, that for all practical purposes we may regard it as non-existent.¹

28. Medical concurrence in belief of non-communicability of disease by vaccination.—Those who have had most to do with the performance of vaccination on the one hand, and those who had been most concerned in the treatment of infantile disease on the other, concur in the belief of the non-communicability of disease by vaccination. This was very forcibly brought out in the evidence on the subject given in 1871 before the Select Committee of the House of Commons on the Vaccination Act of 1867, who themselves endorsed the opinion in their report. Sir Dominic Corrigan, Mr. Marson, Dr. A. Wood, Sir William Jenner, Sir William Gull, Dr. West, and Mr. Hutchinson (men of world-wide reputation and unequalled experience), all concurred in the view of a properly performed vaccination not communicating any other disease than vaccinia. What names at all comparable with these did the anti-

¹ *Handbook*, p. 338.

vaccinators bring forward in support of their arguments? Absolutely none. Their chosen champions who argued on this subject in 1871 were two obscure practitioners, a homœopath, a whilom clergyman, a lawyer, and one or two laymen, who, after having had, with their colleagues, a most patient hearing on this subject and on others for eight whole days (their evidence occupying 152 foolscap pages of the official Blue Book), had to undergo the humiliation of finding all their facts overthrown and their arguments exploded by the scientific witnesses who followed.

29. Opinion of Select Committee of House of Commons on the question.—I shall be excused here for reproducing an extract from the report of the Select Committee itself, because the latter contained representatives of all shades of opinion, and went most thoroughly and impartially into the whole subject. A committee, containing amongst others the names of Mr. Forster, Mr. Cave, Mr. W. H. Smith, Mr. Muntz, Lord Robert Montagu, Mr. Jacob Bright, Dr. Lyon Playfair, Mr. Peter Taylor, Sir Dominic Corrigan, Dr. Brewer, and Mr. Hibbert, could hardly be said to be one-sided in their views on the question ; yet this was their unanimous report :—

‘ Eight sittings of your Committee have been occupied in hearing the evidence of persons who assert that vaccination is useless and injurious, and who therefore object to its enforcement and encouragement by the law.

‘ After careful consideration of this evidence, and of medical and other evidence given in reply, your Committee agree with the general opinion,—

‘ That the cow-pox affords, if not an absolute, yet a very great protection against an attack of small-pox ; and an almost absolute protection against death from that disease.

‘ That if the operation be performed with due regard to the health of the person vaccinated, and with proper precautions in obtaining and using the vaccine lymph, there need be no apprehension that vaccination will injure health or communicate any disease.

‘That small-pox unchecked by vaccination is one of the most terrible and destructive of diseases, as regards the danger of infection, the proportion of deaths among those attacked, and the permanent injury to the survivors; and, therefore,

‘That it is the duty of the State to endeavour to secure the careful vaccination of the whole population.

‘Your Committee have no doubt that the almost universal opinion of medical science and authority, is in accordance with Dr. Gull when he states that “vaccination is as protective against small-pox as small-pox itself;” with Dr. West, when he gives as the result of his experience as physician to the Children’s Hospital in Great Ormond Street, and as having had charge of between 50,000 and 60,000 children since 1835, that “he does not think that vaccination does produce disease;” and with Sir William Jenner, when he says, “I should think myself wicked, and really guilty of a crime, if I did not recommend every parent to have his child vaccinated early in life.” Against this evidence in favour of vaccination, the prevalence of the present small-pox epidemic, especially in the metropolis, has been alleged. Your Committee, however, believe that, on the one hand, if vaccination had not been general, this epidemic might have become a pestilence as destructive as small-pox has often been where the population has been unprotected; and that, on the other hand, if this preventive had been universal, the epidemic could not have approached its present extent.’

30. Animal vaccination.—Notwithstanding this weight of authority, however, parents are constantly to be found who, whilst not objecting to vaccination in the abstract, decline to run the risk which they imagine exists of some other disease than vaccinia being implanted by vaccination in the systems of their children. People of this description are the most difficult for vaccination authorities to deal with, as no amount of fines will induce them to change their erroneous opinions.¹ For the

¹ The question of the extent of prosecutions for non-compliance with the Vaccination Acts does not fall within the scope of this pamphlet; but I have thought it useful to print in the Appendix (B) an official

benefit of such persons, and also for the renewal of stocks of lymph which have become by some means or other enfeebled, it has been proposed to have recourse to what is called animal lymph, or lymph which, taken originally from an undoubted case of 'spontaneous' cow-pox, has been cultivated from calf to calf without ever passing through the system of a human being.

In another capacity I have recently taken a considerable share in pressing this question on the attention of the Government; and I, therefore, at the present moment, only briefly advert to the results of a conference which was held under the auspices of the Parliamentary Bills Committee of the British Medical Association on the 4th, 18th, and 31st December last. In a report¹ which I prepared for the assistance of the conference, I went at length into the advantages of calf lymph, and into the very great improvements which have been effected in the working of that system since the Government decided, in 1869, not to give encouragement to animal vaccination. I brought forward evidence to show that the objections to it are now no longer tenable, and I suggested the establishment of a calf vaccine service by the Government with a view to supplying a felt want of calf lymph for the purposes above stated.

At this conference, which was largely and influentially attended, we had the advantage of the opinions of three of the Government medical officials, Dr. Stevens, Dr. Ballard, and Dr. Cory. None of these gentlemen expressed any antagonism to the use of calf lymph, but thought that its distribution by the Government could not at present be entertained. The general opinion of the conference, however, was strongly in favour of calf lymph and of its more extensive use; and it is satisfactory to record that the Local Government Board have now consented to institute further enquiries into the subject, for the purpose of seeing whether they cannot undertake to

letter from the Local Government Board, giving their views upon the general subject of repeated prosecutions (see p. 67).

¹ *A Preliminary Report on an Investigation of the Results of Vaccination from the Calf.* London: 161A Strand. 1879.

supply calf lymph to those who prefer it to lymph of long humanisation. It needs hardly to be said that calf lymph is free from all possibility of syphilitic contamination, such as has been alleged against humanised lymph. According to the experience of Dr. Henry A. Martin, of Boston, U.S.A., who has now for nearly ten years cultivated calf lymph in the United States on a scale probably unparalleled elsewhere, it is also entirely free from erysipelas. There are other advantages in animal vaccination to which I need not now advert, such as that of supplying on demand a practically illimitable quantity of lymph at very short notice, which in times of epidemic (when there is always a scarcity of lymph for cases of re-vaccination), would be of immense importance.

The use of calf lymph may be expected to increase as its virtues become better known; and, as I have stated my report, its distribution by the Government 'would place the vaccination system of the country on a larger and firmer basis than it now occupies, and would relieve both public and private vaccinators from many of their present difficulties, while it would cut away all solid ground for that mischievous agitation against vaccination which gives so much trouble to legislators and magistrates, and does much to interfere with the means necessary for the extinction of small-pox.'

CHAPTER IV.

SMALL-POX CONTROLLED BY VACCINATION.

31. Allegations that 'vaccination intensifies small-pox epidemics, and the more it prevails the greater is the epidemic mortality'; that 'it does not mitigate small-pox, for it does not diminish the small-pox death rate.'—These two assertions (Nos. 5 & 6, p. 14) being to a great extent variations of the same idea, it will be more convenient to take them together.

Although there are no trustworthy data from which to ascertain the extent of mortality from small-pox in England and Wales in olden times, there are good grounds for asserting that, previously to the discovery of vaccination by Jenner, the deaths from this disease averaged from forty to fifty thousand per annum. With regard to London, however, the evidence of terrible epidemic small-pox fatality is conclusively proved by the old London Bills of Mortality. In Dr. Farr's valuable article on Vital Statistics in McCulloch's 'Account of the British Empire,' it is shown that in the twenty-seven years, 1629-35 and 1660-79, the annual mortality from small-pox in London was equal to nearly 16,000 per million persons living; and in the forty years, 1728-57 and 1771-80, to nearly 18,000 per million living. We know, however, that in the forty-two years of civil registration, 1838-79, the nominal death rate from small-pox in London has averaged only 410 per million. Thus the average fatality of small-pox in London was more than *forty times greater* during sixty-seven years of the 17th and 18th centuries, than it has been in the most recent forty-two years of the 19th century, notwithstanding the remarkable epidemic of 1871.

Excepting 1838, when small-pox was severely epidemic in London, there has been no near approach to such fatality of small-pox in the metropolis during the past forty-two years as that which occurred in 1871; and yet the rate of mortality from small-pox in that year was less than one-seventh of the average annual rate of mortality from that disease in the sixty-seven years of the 17th and 18th centuries of which we have records. Anti-vaccinators have taken advantage of the difficulty of obtaining trustworthy records of small-pox mortality for the years prior to vaccination and civil registration, to ridicule all assertions of the terrible fatality of this disease in the olden time. They have asserted that small-pox was a comparatively harmless disease before the introduction of inoculation. These London statistics for twenty-seven years of the 17th century and forty years of the 18th century, establish the fact of the constant and fatal prevalence of small-pox, causing an annual death rate equal to sixteen per 1,000 of the population.

32. Results of more general practice of vaccination.—

Let us now consider the evidence afforded by the national death register, of the effect of the more general practice of vaccination (in great measure due to the Compulsory Vaccination Acts) upon small-pox mortality. Since 1837, the registration of deaths has been, within extremely narrow limits, complete, and there is little reason to doubt that, so far as small-pox is concerned, causes of death have been returned with sufficient accuracy to afford a sound basis for statistical deduction. For this purpose it will be more satisfactory to deal with the figures for the whole of England and Wales, instead of for London only, as we were forced to do with regard to pre-registration periods. As regards the causes of death in England and Wales, it is much to be regretted that they have never been abstracted and classified for the four years 1843–6, causing a break in the detailed mortality statistics of the forty-one years 1838–78. This, however, will not seriously disturb the mortality statistics from which we can draw conclusions as to the effect of vaccina-

tion upon small-pox fatality. Vaccination has undoubtedly become more general year by year since Jenner's time, but as no records exist of the number of vaccinations performed until recent years, it is necessary to assume that the first Compulsory Vaccination Act, passed in 1853, caused, as it undoubtedly did, a large increase in the proportional number of infants vaccinated. During the sixteen years of civil registration, 1838-53 (excluding the four years 1843-6, for reasons before stated), prior to compulsory vaccination, the annual death rate from small-pox in England and Wales averaged 420 *per million* persons living. In the *succeeding* twenty-six years of compulsory vaccination, 1854-79, the annual death rate from small-pox averaged 208·5 *per million* living (see Table I., Appendix C., p. 70). Thus small pox fatality in England and Wales has declined since the passing of the first Compulsory Vaccination Act to less than one-half of that which was recorded in those years of civil registration (for which records exist) prior to the passing of that Act. This result has been obtained in spite of the remarkable epidemic of 1871, by far the most fatal that has occurred in England and Wales since 1838. It may be admitted that one of the effects of vaccination has been to confine the mortality from small-pox to epidemic periods. Before compulsory vaccination, however, small-pox may be said to have been constantly epidemic, whereas in many recent years the fatality of this disease has been almost *nil*. For instance, during the first four years of civil registration, 1838-41, the small-pox death-rate per million living ranged from 1,064 to 400. In the epidemic years 1871-2, the small-pox rate was 1,024 and 833 per million.

Since the close of that epidemic, however, the highest rate in the seven years, 1873-79, has been 175 in 1877, while it was but forty per million in 1875, and twenty-two per million in 1879. The only fair way, therefore, to calculate the relative fatality of small-pox before and after compulsory vaccination, is to take long periods, including both epidemic and non-epidemic years. Calculated in this way, the fatality of small-

pox has undoubtedly shown a decline of one-half since the first Compulsory Vaccination Act came into operation (Tables I. and II., App. C. and D., pp 70 and 71).

33. Change in proportional fatality of small-pox at different ages.—One of the instructive effects of the increased practice of vaccination has been to materially change the proportional fatality of small-pox at different ages. Take for instance the five years, 1848–52, and compare it with five more recent years, 1873–77. In the earlier period 69 per cent. of the deaths from small-pox were of children under five years of age; whereas in the later period this proportion had declined to 25 per cent. If we exclude the deaths under one year, because many infants die of small-pox before arriving at the usual age for vaccination, the change of proportion is still more remarkable. In 1848–52 no less than 44 per cent. of deaths from small-pox were of children aged one year and under five, whereas in 1873–7 the proportion had fallen to 13 per cent. There is no ground for asserting that the form of disease has changed during the last twenty years, and there seems to be no other explanation of this remarkable change in the age proportion of the fatal cases of small-pox than the effect of vaccination. Among adults aged over twenty years there has been an equally large increase in the proportional fatality of small-pox; in the five years, 1838–52, only 11 per cent. of the total deaths from small-pox were of persons of these ages, whereas in 1873–7 the proportion was equal to 48 per cent. (see Table III., Appendix E., p. 72).

34. Increasing protection of young children from fatal small-pox.—As improvement in administrative arrangements reduces the decreasing number of children who annually escape vaccination, and as the quality of the protection afforded becomes better, as it is undoubtedly doing under the careful superintendence of public vaccination that is now carried out by Government, the change referred to in the preceding section will become still more marked.

As bearing on this question, the recent statistical experience

of the Hospitals of the Metropolitan Asylums Board, with reference to the admission of young children, and the degree of their vaccination, has considerable interest. Between the middle of 1876 and the end of 1878, 1,075 children under the age of five were admitted into the Hospitals, a number somewhat larger in proportion to the total admissions than that admitted in the epidemic of 1871-72. Of these 1,075 children, 483, or 44·9 per cent., died, this being a lower rate of mortality than that shown among children of the same age in the former epidemic, when the rate was 52·1 per cent. Of the 1,075 children, 238 were vaccinated, 837 were unvaccinated. Among the vaccinated the number of deaths was 13, a rate of 5·4 per cent. Among the unvaccinated the number of deaths was 470, a rate of 56·1 per cent. Comparing these rates with those of 1871-72, we find that during that period 38 deaths occurred among 195 vaccinated children, a rate of 19·4 per cent.; and 433 deaths among 708 unvaccinated children, a rate of 61·1 per cent. Thus, in the recent epidemic, there was a diminution in the death-rate of vaccinated infants of a very remarkable kind, which it seems fair to attribute to an increase of care in the performance of the operation.

35. Influence of sanitary measures on small-pox.—It is perhaps well that I should at this point advert to the argument, out of which much capital has been made, that the decline of small-pox mortality has been due, not to vaccination, but to improved sanitary measures. The best authorities on the subject agree that the influence which sanitary conditions exercise on small-pox mortality is comparatively very small. Nearly all the anti-vaccination witnesses before the Select Committee of 1871 credited 'sanitary measures' with being the cause of the decrease of small-pox mortality; but Mr. Simon replied (Q. 2963) that, although there is undoubtedly very much greater likelihood that the infection of small-pox will spread where people are huddled together, and where one person having the disease is breathing a confined atmosphere with many susceptible persons, yet, barring that sort of influence, he could not say that

he was aware of sanitary influences exerting much control over small-pox. He added, in reply to a question (2964), whether he considered that sanitary improvements, both as regards the dwellings and as regards greater cleanliness of the person, might in themselves very much diminish the prevalence of small-pox, that he had not evidence that it could do so. Dr. Seaton, the late medical officer of the Local Government Board, speaks very strongly on this subject in his 'Report on the Small-pox Epidemic of 1871-72.' He says—'If I have not adverted to any influence which general sanitary conditions may have exercised on the small-pox mortality at home or abroad, it has been because the amount of any such influence is known to be wholly insignificant as compared with that of the presence or absence of effective vaccination in controlling small-pox mortality, especially in young children. What change of sanitary conditions, for instance, could have so reduced in a few years the proportionate small-pox deaths among young children, that in the chief towns of Scotland the deaths of children during the recent epidemic have been little more than a tenth of what they would have been according to the rate which prevailed before the compulsory vaccination law? The power of vaccination to save young children from fatal small-pox, no matter what their sanitary conditions, and (with rare exceptions) notwithstanding extreme epidemic influence, is one of the best established facts in medical science. It was abundantly illustrated in medical practice in the recent, as it has been in every preceding epidemic.'¹

¹ *Fourth Report (N.S.) of Medical Officer of Local Government Board for the Year 1874*, p. 84.

CHAPTER V.

VACCINATION AS A PROTECTIVE AGAINST SMALL-POX.

36. Allegation that 'vaccination has no power of preventing small-pox; for nearly everyone who takes small-pox has been vaccinated.'—Nothing can be more flagrant than this assertion (No. 7); for the whole of the evidence on the subject points the other way. It is true that anti-vaccinators point to the large number of deaths from small-pox among persons who have been vaccinated in infancy as proof of the inutility of vaccination. The fact may be admitted to afford proof either that there is a large proportion of inefficient vaccination performed, or that infant vaccination is not the protection for life that Jenner was sanguine enough to anticipate. It is probable that the fact of so many vaccinated persons dying of small-pox may be partly due to both these causes. Any examination of the vaccination marks of the children in an elementary school discloses a lamentably large proportion of comparatively unprotected children.¹ Moreover, English mortality statistics show

¹ Dr. Bridges, the Local Government Inspector for the Metropolis, states in a recent report, that of the children under seven years of age in the metropolitan pauper schools examined by him in 1878 with regard to vaccination, not quite a third showed vaccination marks combining good quality with sufficient quantity, and in more than a third the vaccination was of indifferent quality. He observed, also, that there was a most striking contrast in these respects between different districts of the metropolis; between, for instance, Marylebone (53 per cent. efficiently vaccinated), Westminster, Poplar, City of London on the one hand, and St. George's (18 per cent.), St. Olave's, Fulham, and Holborn on the other. It would be interesting to know what is the character of vaccination performed by the public vaccinators in these several districts.

that whereas the average rate of mortality from small-pox has shown so remarkable a decline in recent years, it has actually shown an *increase* among persons aged above twenty years. Take the same two periods of five years before referred to (page 38), 1848-52 and 1873-77. The annual death-rate at all ages declined from 343 to 101 per million, and under five years, from 1,811 to 189 per million; on the other hand, over twenty years of age, the rate of mortality rose from 70 in the earlier to 89 per million living at those ages in the later period (App. E.) It seems probable that the adult population of the present day contains a larger proportion of persons susceptible of small-pox than it did thirty years ago. The explanation of this appears to be that infant vaccination, even if not thoroughly efficient, is a sufficient protection from small-pox up to puberty, although it ceases to be a complete protection after that age. Before the days of general and compulsory vaccination, a far larger proportion of the population was protected from small-pox by a previous attack of the disease than is now the case. This, in conjunction with incomplete protection after puberty afforded by much of our vaccination, leaves a larger proportion of our adult population susceptible to the disease in epidemic seasons. The natural and complete remedy for this is re-vaccination at puberty, which needs to be encouraged in every possible way, and even deserves to be made compulsory. (See Chapter VI., p. 53 *et seq.*)

37. Effect of vaccination upon individual susceptibility to small-pox.—Let us now examine some actual facts as to the effect which vaccination has upon the susceptibility to small-pox in the individual. And first it must be carefully borne in mind that as only about four per cent. of the population escape vaccination, the vaccinated are twenty-four times as numerous as the unvaccinated; and, if the anti-vaccination theory be correct, there should therefore be twenty-four times as many attacks amongst the former as amongst the latter. Now, what are the facts? I might give a score of illustrations to prove the fallacy of the argument, but I will confine myself to the

latest. From the outbreak of the small-pox epidemic in the metropolis in 1876, until the commencement of October 1879, there were treated in the Hospitals of the Metropolitan Asylums Managers 15,171 small-pox patients, of whom 11,412 were vaccinated and 3,759 unvaccinated, or as 3 to 1. A vaccinated person had therefore eight times as many chances ($\frac{24}{3}$) of escaping small-pox as the anti-vaccinators would give him credit for. But this is not all. The 11,412 vaccinated persons admitted include the majority of those who stated that they had been vaccinated, but upon whom no traces of vaccination were discernible. *No case of small-pox came within the cognizance of any of the medical superintendents of any person who had been efficiently vaccinated and successfully re-vaccinated.* This is not, as might at the first blush be imagined, by any means an unusual result; for in the terrible epidemic of 1871-2, which far surpassed in malignity any recent experience of the disease, only four cases out of the 14,800 cases admitted to these Hospitals were those of persons on whom re-vaccination had been properly performed. (See further, Chapter VI.)

38. Beneficial effects of vaccination most marked in mortality from small-pox.—It is, however, in the *mortality* from small-pox that the beneficial effects of vaccination in the individual are most marked. I have already given, in a previous section (p. 12), the table compiled by Mr. Marson from his unequalled experience of the different degrees of safety against death by small-pox amongst vaccinated and unvaccinated persons, and I will only add—since it is a matter of experience in every epidemic—some recent facts on the subject. During the small-pox epidemic of 1876-8 in London the total number of deaths that occurred in the Metropolitan Asylums Hospitals was 2,677. Of these 1,008 were vaccinated and 1,669 were unvaccinated cases, the percentage mortality upon the admissions being therefore 8·8 per cent. of the vaccinated, and no less than 44·4 per cent. of the unvaccinated.

39. Varying protection afforded by different qualities of vaccination.—These figures, it will be observed, discriminate

only between 'vaccinated' (however badly the vaccination may be performed) and 'unvaccinated.' But if the facts as to the quality of the vaccination come to be studied, the difference becomes still more strongly marked. In 1871 Mr. Marson gave before the Select Committee of the House of Commons the results of thirty-two years' (1836-67) observations by him at the London Small-pox Hospital, as to the quality of vaccination in the fatal cases of small-pox. Summarily, the thirty-two years' observations showed that, of 13,765 reputedly vaccinated patients admitted to the Hospital during that period, the vaccination was very defective in 11,172, of whom 1,027 died; was reasonably good (as represented by three characteristic marks) in 1,079, of whom twenty-one died; and was quite up to the now acknowledged standard in 1,505, of whom only thirteen died. These facts, while they are conclusive as to the necessity for vaccination, if it is to be a complete or nearly complete protection against fatal small-pox, being performed in the most thorough and careful way, illustrate also the extent to which imperfect and insufficient vaccination was practised at the period when the present adult vaccinated population would have received their vaccination.

In the Stockwell and Homerton Hospitals during the epidemic of 1871-2, out of 2,382 patients having marks of vaccination, 1,866 had characteristic marks (one or more), and 516 had marks which were bad and indifferent. Of the former seventy died, or 3·9 per cent.; of the latter 129, or 25 per cent. Of the 1,866 patients with characteristic vaccine marks, 1,306 had but one or two of such marks, of whom sixty, or 4·5 per cent. died; 560 had three or more such marks, of whom only ten, or 1·8 per cent. died.

40. Experience of Metropolitan Asylum Hospitals in recent epidemic. —The experience of the Hospitals of the Metropolitan Asylums Board in the latest epidemic of small-pox in London (that of 1876-8) has been given in a most masterly and exhaustive manner in a report lately presented by Dr. J. H.

Bridges to the Local Government Board.¹ Dr. Bridges says that the first broad fact that meets the eye in studying the vaccination statistics of these hospitals is that, while the vaccinated cases of small-pox were three times as numerous as the unvaccinated (it being always borne in mind that the vaccinated are twenty-four times as numerous as the unvaccinated), the absolute number of deaths among the unvaccinated was twice as great as among the vaccinated. The conclusion is obvious that, given a community all attacked by small-pox, the death rate of unvaccinated cases of small-pox is six times as great as the death rate of vaccinated cases. This proportion is obtained from a careful analysis of 10,181 cases of small-pox admitted into the Metropolitan Hospitals during the last few years, as indicated in the note below.² Cases of doubtful vaccination, *i.e.* cases where vaccination was stated to have been performed, but in which there was no evidence of its performance, are excluded from this list. Of these 10,181 cases, 7,674 were vaccinated; 2,507 unvaccinated; 1,833 of the cases ended in death; and of these deaths 1,205 occurred among the unvaccinated cases; 628 among the vaccinated. In other words, the death rate among the vaccinated cases was 82 per thousand. The death rate among the unvaccinated cases was 481 per thousand. Striking as this conclusion is, it by no means places the truth as to vaccination in its strongest and clearest light.

41. Distribution of small-pox mortality amongst the various classes of vaccinated and unvaccinated persons.—Vaccinated persons may be divided into two groups: those in whom the vaccination mark is of good quality; those in whom it is indifferent. Each of these groups may be further subdivided according to the number of the vaccination marks, varying

¹ Report on Small-pox in the Hospitals of the Metropolitan Asylums Board from 1876 to 1878. *Parliamentary Paper No. 75 of Session 1880.*

² Homerton Small-pox Hospital, from February 1, 1871, to December 31, 1878; Homerton Fever Hospital, temporarily appropriated to small-pox, from December 1876, to April 1877; Hampstead Hospital, from November 1876, to December 1878; Fulham Hospital, from March 10, 1877, to October 12, 1877.

VACCINATION MARKS OF PATIENTS AT HOMERTON SMALL-POX HOSPITAL, 1871-1878.

—		Admissions	Deaths	Death-rate per 1,000	—
Class I.—Vaccination of good quality.					
Sub-Class 1. Four marks or more.	{ Male 139 } { Female 124 }	263	{ Male 3 } { Female 1 }	4	15
" 2. Three marks	{ Male 226 } { Female 170 }	396	{ Male 7 } { Female 5 }	12	30
" 3. Two marks	{ Male 311 } { Female 221 }	532	{ Male 11 } { Female 6 }	17	32
" 4. One mark.	{ Male 226 } { Female 209 }	435	{ Male 11 } { Female 10 }	21	39
General death rate of Class I., 33 per 1,000.					
Class II.—Vaccination of indifferent quality.					
Sub-Class 5. Four marks or more.	{ Male 175 } { Female 169 }	344	{ Male 9 } { Female 10 }	19	55
" 6. Three marks	{ Male 267 } { Female 273 }	540	{ Male 22 } { Female 20 }	42	77
" 7. Two marks	{ Male 575 } { Female 377 }	952	{ Male 71 } { Female 33 }	104	109
" 8. One mark.	{ Male 444 } { Female 377 }	821	{ Male 74 } { Female 56 }	130	158
General death-rate of Class II., 111 per 1,000.					
Class III.—Stated to have been vaccinated, but with no evidence of vaccination.					
Sub-Class 9	{ Male 419 } { Female 374 }	793	{ Male 113 } { Female 103 }	216	272
Death rate of Class III., 272 per 1,000.					
Class IV.—Unvaccinated.					
Sub-Class 10.	{ Male 834 } { Fem. 643 }	1,477	{ Male 394 } { Female 282 }	676	452
Death rate of Class IV., 452 per 1,000.					

from one to four, and upwards. If to these two groups, and eight sub-groups, of vaccinated persons be added the two divisions containing the doubtfully vaccinated and the certainly unvaccinated, the cases admitted into hospital may be ranged, with reference to vaccination, in ten divisions.

The cases admitted into the Homerton Small-pox Hospital, from its opening in February 1871 down to December 31, 1878, numbered 6,533, of which 1,211 died; the gross rate of mortality being, therefore, 18·5 per cent.

The table on p. 46 shows how this mortality was distributed through the various classes of vaccinated and unvaccinated persons.

It will be observed that the death rate ascends in a regular sequence from the first to the tenth of these divisions. A comparison of the first sub-class with the last shows that thoroughly efficient vaccination diminishes the danger from small-pox to one-thirtieth of its natural degree. On comparing the eighth with the tenth, it is seen that a very inferior form of vaccination reduces the natural mortality to one-third. On comparing the eighth with the first the difference in value between very good and very poor vaccination appears as ten to one.

The experience of the Hampstead Small-pox Hospital leads to the same conclusion. Between November 1876, and December 1878, there were admitted into this Hospital 3,352 cases, which are ranged, with reference to their vaccination, on p. 48.

Allowing for the different points at which each observer will draw the line between marks of good quality and of indifferent quality, the broad result is the same. The contrasts between vaccination and unvaccination, and between good vaccination and bad vaccination, are unmistakable.

42. Conclusion as to relative mortality amongst vaccinated and unvaccinated.—But one conclusion is possible from these figures, as from the whole of the published statistics on the subject: that so far from nearly every one who takes small-pox being vaccinated, the unvaccinated are attacked in an

VACCINATION MARKS OF PATIENTS AT HAMPSTEAD SMALL-POX HOSPITAL, 1876-1878.

—		Admissions	Deaths	Death-rate per 1,000	—
Class I.—Vaccination of good quality.					
Sub-Class 1. Four marks or more.	{ Male 114 } { Female 108 }	222	{ Male 5 } { Female 2 }	7	31
2. Three marks	{ Male 143 } { Female 111 }	254	{ Male 10 } { Female 5 }	15	59
3. Two marks	{ Male 151 } { Female 115 }	266	{ Male 6 } { Female 6 }	12	45
4. One mark.	{ Male 111 } { Female 87 }	198	{ Male 13 } { Female 6 }	19	95
General death rate of Class I., 57 per 1,000.					
Class II.—Vaccination of indifferent quality.					
Sub-Class 5. Four marks or more.	{ Male 117 } { Female 124 }	241	{ Male 7 } { Female 6 }	13	58
6. Three marks	{ Male 161 } { Female 173 }	334	{ Male 18 } { Female 11 }	29	86
7. Two marks	{ Male 272 } { Female 239 }	511	{ Male 40 } { Female 28 }	68	133
8. One mark.	{ Male 223 } { Female 203 }	426	{ Male 34 } { Female 27 }	61	143
General death rate of Class II., 113 per 1,000.					
Class III.—Stated to have been vaccinated, but with no evidence of vaccination.					
Sub-Class 9	{ Male 28 } { Female 25 }	53	{ Male 11 } { Female 6 }	17	320
Death rate of Class III., 320 per 1,000.					
Class IV.—Unvaccinated.					
Sub-Class 10.	{ Male 455 } { Female 392 }	847	{ Male 234 } { Female 163 }	397	468
Death rate of Class IV., 468 per 1,000.					

immensely larger proportion than the vaccinated, and that when attacked the thoroughly vaccinated person has very many more chances of recovery than the unvaccinated.

All kinds of attempts have been made to discredit hospital statistics of small-pox mortality, but no impartial persons, anxious to arrive at the truth of this important matter, can afford to disregard them. The temperate and careful report by Mr. Marson upon 5,982 cases treated in the Small-Pox Hospital during the 16 years, 1836 to 1851, contributed not a little to convince Parliament, the public, and the medical profession, of the expediency of compulsory vaccination. The elaborate analysis of these 5,982 cases is one of the most valuable contributions to our knowledge of the effect of vaccination upon small-pox mortality. Anti-vaccinators dwell upon the fact of the large and increasing proportion of *vaccinated* cases of small-pox admitted to hospital in most epidemics. They ignore the amount of inefficient vaccination which exists and is going on around us. The rate of mortality among so-called 'vaccinated' cases in hospitals is, as we have seen, in precise proportion to the number and quality of the vaccination marks. Marson's evidence, which has already been quoted, is strictly supported by subsequent hospital evidence. It has never been shaken, but has been in every way fully corroborated.

43. Results of examination of vaccination marks of recruits.—The copious statistics which I have just quoted must surely be more than sufficient to prove the immense advantage which well-vaccinated persons have over unvaccinated persons, both as regards attack by small-pox, and death from it if attacked. The hospital figures which I have given are, however, abundantly corroborated by the experience derived from the army, and in order to show that it is not on hospitals alone that we need to rely for our facts on this question, I extract from a valuable paper by Surgeon-Major S. Archer, in a recent Blue Book of the Army Medical Department, the following instructive particulars.¹ Dr. Archer, on assuming charge of the

¹ *Report of Army Medical Department for 1877*, p. 229.

Liverpool recruiting district in October 1876, was much struck with the large number of recruits appearing before him who were either imperfectly vaccinated, or who had not been vaccinated at all, and it occurred to him that it would be interesting to keep a record of the marks of the recruits, so as to obtain data for the construction of a table which would give some idea of the state of vaccination of the adult male population, and also of the relative liability to contract small-pox as shown by the number of marks in those who had suffered from the disease. A summary of the results of his examination of 5,000 cases is subjoined.

Classes	Total numbers examined in each Class	Numbers bearing Small-pox Marks in each Class	Percentage of total number of Cases in each Class	Percentage in each Class bearing Small-pox Marks
I. Three or more good marks }	1089	10	21.78	.91
II. Two good marks .	1917	41	38.34	2.13
III. One good mark .	1097	45	21.94	4.10
IV. No good marks .	340	31	6.80	9.11
V. Unvaccinated, or having no marks }	557	190	11.14	34.11
	5000	317	100.00	—

(In this table the *good* marks are alone counted, the bad marks being left out of consideration.)

This table, it will be observed, shows two important facts: (1) It corroborates what has already been stated in another section, that a large proportion of adults of the present generation are imperfectly protected against small-pox by inadequate vaccination. Those in Classes III. and IV. at the least, must be held to be imperfectly vaccinated, and adding these to Class V. it will be seen that 40 per cent. of the young men examined were insufficiently protected against small-pox. (2) The table also shows in a very striking manner how the liability to contract small-pox diminishes in proportion to the number of good vaccine vesicles which have been produced, together with the

extremely large proportion of cases occurring in the unvaccinated, and in those not bearing cicatrices. Thus, whilst less than 1 per cent. of the recruits protected by first-class vaccination had had small-pox, more than 34 per cent. of the unvaccinated, and those having no marks, had been attacked by the disease. Doubtless the same experience as this would be forthcoming from many other places; but it is really quite unnecessary. Universal experience testifies to the enormous advantage which a well-vaccinated person has in resisting an invasion of small-pox over his unvaccinated neighbour, and no amount of rhetoric can alter so stern and instructive a fact.

44. Mr. Marson on degrees of severity in small-pox after vaccination.—I cannot better finish this chapter than by quoting the words of Mr. Marson as to the importance of thorough vaccination. ‘Small-pox after vaccination,’ says Mr. Marson, ‘has, in fact, various degrees of severity and modification: from the slightest form, in which there is none, or hardly any eruption at all, to the most severe confluent cases, closely, almost exactly, resembling the disease in the unvaccinated; and it also assumes the petechial and malignant types after vaccination, just as in the unvaccinated state. All this depends in a great measure on the way in which patients have been vaccinated. Those who have been fortunate enough to have been vaccinated in four or more places with lymph that leaves good, easily perceptible cicatrices, have almost invariably a slight form of small-pox when it occurs; but those who have only one or two marks from vaccination, such as are hardly visible, will probably have a severe form of the disease; and those who have no marks at all are in still worse circumstances. What we contend for, is that, if possible, all should be vaccinated in the *best way*; at least the attempt should be made to vaccinate all in the best way, that there should be as little as possible of haphazard vaccination, done with a view that if the operation takes effect badly it can be done again. By such a proceeding persons often take vaccination badly, and cannot be made to take it properly afterwards; the imperfect success pre-

vents its taking fully again, and yet some day they may take small-pox severely, and perhaps die of it. Every effort should therefore be made that there may be as few imperfect vaccinations as possible.¹

¹ Article 'Small-pox' in Reynolds' *System of Medicine*, vol. i. p. 472.

CHAPTER VI.

RE-VACCINATION.

45. Desirability of re-vaccination.—By vaccination in infancy, if thoroughly well-performed and successful, most people are completely insured, for their whole life-time, against an attack of small-pox; and in the proportionately few cases where the protection is less complete, small-pox, if it be caught, will, as has already been shown, generally be, in consequence of the vaccination, so mild a disease as not to threaten death or disfigurement. If, however, the vaccination in early life has been but imperfectly performed, or has from any other cause been but imperfectly successful, the protection against small-pox is much less satisfactory; neither lasting so long, nor, while it lasts, being nearly so complete as the protection which first-rate vaccination gives. In consequence of the large amount of imperfect vaccination which has until very recent years existed, the population contains very many persons who, though nominally vaccinated and believing themselves to be protected against small-pox, are really liable to infection, and may in some cases contract as severe forms of small-pox as if they had never been vaccinated. Partly because of the existence of this large number of imperfectly vaccinated persons, and partly because also even the best infantine vaccination sometimes in process of time loses more or less of its effect, it is advisable that all persons who have been vaccinated in infancy should, as they approach adult life, undergo re-vaccination.

46. Age at which re-vaccination should be performed.—Generally speaking, the best time of life for re-vaccination is

about the time when growth is completing itself, say from fifteen to eighteen years of age ; and persons in that period of life ought not to delay their re-vaccination till times when there is special alarm of small-pox : first, because they can never tell how soon, or by what chance, they may (even at times when there is little prevalence of that disease) be exposed to its infection ; and secondly, because of the much more advantageous conditions under which the re-vaccination can be performed when it can be done leisurely, than when it has to be done under the pressure caused by a panic. When, however, small-pox becomes epidemic, not only should all persons above fifteen years of age who had hitherto neglected to have themselves re-vaccinated be very careful to neglect it no longer, but in proportion as there is prevalence of small-pox in any neighbourhood, or as individuals are from personal circumstances likely to meet chances of infection, even the age of fifteen should not be waited for, especially not by young persons whose marks of previous vaccination are unsatisfactory. The rule applicable to circumstances of special danger is this : that every one past childhood on whom re-vaccination has not before been successfully performed, should without delay be re-vaccinated.¹ In fact the prophylactic importance of re-vaccination is so great that it seems well worth consideration whether more direct encouragement of it, even to the extent of its compulsory performance (as in Germany), should not be made by Government.

47. Absolute protection afforded by re-vaccination to nurses of Small-pox Hospital.—Re-vaccination, once properly and suc-

¹ Legal provisions for re-vaccination are made in the 8th Section of the Vaccination Act, 1867, in Section IV. of the Regulations which the Lords of the Council, under authority of that Act, issued in their Order of February 18, 1868, and in the 9th Section of the Vaccination Act, 1871. Under these provisions re-vaccination is now performed by all public vaccinators at their respective vaccinating stations ; and, so far as is not inconsistent with the more imperative claims for primary vaccination, any person coming within the terms of these provisions may, on applying to the public station of the district in which he resides, obtain re-vaccination free of personal cost.

cessfully performed, does not appear ever to require repetition. The nurses and other servants of the London Small-pox Hospital, when they enter the service (unless it be certain that they have already had small-pox), are invariably submitted to vaccination, which in their case generally is re-vaccination, and is never afterwards repeated. So perfect is the protection, that though the nurses live in the closest and most constant attendance on small-pox patients, and though also the other servants are in various ways exposed to special chances of infection, Mr. Marson, the late Resident Surgeon of the Hospital, during his forty-one years of office there, never knew small-pox affect any one of these nurses or servants. Of late, an attempt has been made to invalidate this important evidence on the faith of the statement of an anti-vaccination witness before the Select Committee of 1871, that when he went to the Small-pox Hospital on March 2, 1871, the door was opened to him by a nurse who was pitted with the small-pox. Mr. Marson subsequently explained to the Committee that this woman came into the hospital as a patient, was for some years the matron's housemaid, and was then the head nurse. Mr. Marson also stated (Q. 4226) that in consequence of the other large hospitals which had been lately established, he had not quite the same facility for getting nurses, and he therefore employed those who had come in as patients and were willing to stay. The argument which the anti-vaccinators strive to adduce from this reply of Mr. Marson's is, that the nurses, *as a class*, are not protected by re-vaccination, but by small-pox. It will be observed that Mr. Marson's statement is that the nurses and other servants, when they enter the service (*unless it be certain that they have already had small-pox*) are invariably subjected to vaccination, with the result that none of them has ever caught small-pox. Of course the particular nurse referred to, and others like her, were not re-vaccinated (*see* Q. 4219), and therefore they do not come into the account. The accuracy of Mr. Marson as a recorder was exceptionally great, and it is not in the least likely that he should have made an error of the kind attributed to him. I

may mention, moreover, that it is within my personal knowledge that when, in 1876, Mr. Marson was asked as to his further experience of the immunity of his re-vaccinated nurses from small-pox, he at once and unreservedly corroborated, as applicable to the whole of his unparalleled experience, the statement as to their absolute protection which was so widely circulated by the Royal College of Physicians in 1871.

48. Experience as to protection of nurses by re-vaccination of Metropolitan Asylums Hospitals.—But even leaving the Highgate Small-pox Hospital out of consideration altogether, the evidence gained at the Metropolitan Asylums Hospitals as to the protection from small-pox afforded by re-vaccination to the nurses and attendants on the sick, is singularly conclusive.¹ Thus Dr. McCombie writes from Deptford:—‘Since the hospital was re-opened in April 1878, no officer or servant has contracted small-pox in the discharge of his duties here. One servant showed symptoms of small-pox a few days after entering the service, but as she was evidently incubating small-pox at the date of entering on duty here, I do not consider that she contracted small-pox in the discharge of her duty in this hospital. I am informed that during the time the hospital was open in 1877, none of the staff contracted small-pox.’ Dr. Gayton writes from Homerton, after an experience of seven years, in which more than 6,000 patients have been treated for small-pox, that ‘One only amongst the large number of nurses and others who have been occupied here, has contracted the disease. In her case the operation of re-vaccination was accidentally neglected.’ Mr. Bingham writes from Hampstead, after an experience of more than 3,000 cases:—‘One man, a ground labourer, caught small-pox in the early

¹ With regard to these hospitals also, it has been suggested to account for this protection by the statement that the nurses are drawn from the convalescent cases. But the statement is equally incorrect. We have the authority of Dr. Bridges that it is but rarely that such a course has been adopted.

part of the epidemic. By some means he escaped being re-vaccinated, and during a pressure of work was sent into the country to assist in removing soiled clothes. He then contracted small-pox in a modified form, and recovered.'

49. The protective influence of re-vaccination amongst soldiers and sailors.—The annual reports of the Medical Departments of the Army and the Navy afford most striking proofs of the protective power of re-vaccination in adult populations. The soldiers and sailors serving in the United Kingdom may be looked on as virtually a wholly protected force, for now, for several years past, every man serving in the Army or Navy, whether or not he has marks of small-pox or of previous vaccination, is required to be vaccinated on entering the service. This rule has been in force in the Army since 1858, but until some ten years later, there was no rule in the Navy requiring the vaccination of all who entered, whether previously protected or not. This has, however, now been rectified,¹ and the result is seen in the fact that whereas in the days of the absence of such rule the small pox death-rate was much higher in the Navy than in the Army, the rate is now considerably lower, being in fact, for the six years, 1873–8, absolutely *nil*. Indeed, in the whole of the British Navy in all parts of the world, numbering 46,400 men, there were in 1878 but nine cases of small-pox, four on the Home Station, three on the East India, one on the Mediterranean, one on the China Stations. All these nine cases are noted as mild, and were unquestionably modified by

¹ Extract from Navy Medical Instructions, in force some ten years :—
'Queen's Regulations and Admiralty Instructions, 1879, Art. 1,076. § 1. All men and boys entering the service are to be re-vaccinated. § 2. All men who have not been re-vaccinated between their first entry in the service and the age of eighteen shall be re-vaccinated as soon as possible, however good their primary vaccination cicatrices may appear, or even should they present unmistakeable evidence of having suffered from small-pox previous to that age.' In addition, § 6 prescribes the steps to be taken to ascertain the successful re-vaccination of officers.

re-vaccination. In the very large proportion of the men employed in both services, the protection against small-pox is that afforded by vaccination. In 1877 only 5·45 per cent. of recruits proved on examination to have marks of small-pox, whilst 90·85 had marks of vaccination, and 3·69 had neither vaccination nor small-pox marks.

If the records of these 'protected' services be examined to see what ravages are now made in them by small-pox, the disease which, according to Sir Gilbert Blane, was, before the discovery of vaccination, 'one of the greatest embarrassments to the operations of armies,' and obliged ships of war occasionally to quit the seas,¹ we find that during the 18 years, 1859-76 inclusive, the annual deaths from it were considerably less than one per 10,000 (·643 only) amongst the troops serving in the United Kingdom (see Table IV., Appendix F.) More than a third of the whole of the deaths during these 18 years occurred during the small-pox epidemic of 1871-2, the exceptionally severe character of which has already been adverted to. Among the sailors employed on the Home Force, there were, during the twenty years, 1859-78, as nearly as possible, one per 10,000 (1·0085) attacked annually with small-pox (see Table V., Appendix G.) During the same period the cases of small-pox did not exceed annually 9·05 per 10,000 soldiers, and 16·16 per 10,000 sailors. If the influence of the ferocious epidemic of 1871-2 be duly allowed for, a steady decrease in the number of cases and of deaths will be observed from the commencement. In fact, omitting these two years, there has not been a single death from small-pox in the Navy since 1864, *i.e.* sixteen years ago. The recent statistics of the Army are hardly quite so favourable, but still they show that since the year 1865, with the exception of the epidemic years 1871-2, only one single soldier out of the eighty thousand troops serving in the United Kingdom, has on an average died of small-pox in each

¹ *Medico-Chir. Trans.*, vol. x.

year. Figures such as these tell their own tale. If small-pox can by universal vaccination and re-vaccination be practically stamped out amongst soldiers and sailors, the same result could be achieved by adopting the same vaccination rules as are in force in these services to the civil population. I do not myself see why, as I believe is the rule in Germany, re-vaccination should not be made obligatory at puberty under the same regulations as infantile vaccinations are now compulsorily performed. I believe that by this means an immense check would be given to the periodical visitations of small-pox that now occur in this country, so that serious and spreading small-pox would be but little known among us, and the entries of fatal small-pox would eventually be all but banished from our national death-registers.

50. Concluding suggestions.—There are reasons, indeed, for hoping that our defences against small-pox will be stronger in the future than in the present, since the quality of public vaccination is being vastly improved by the rigid inspection of it that is now made by the Government Medical Inspectors. It is the private vaccinators that are most at fault with regard to imperfect vaccination, as they defer too much to the prejudice of mothers, who think one puncture sufficient. Even here, however, an improvement is observable, and as certain of the medical licensing bodies now require evidence of tuition by one of the Government Teachers of Vaccination, before they will grant their diploma, the coming generation of medical men will have much less to answer for in the way of imperfectly performed vaccination, than that which is passing away. It would seem well, however, in any re-arrangement of local authorities to put vaccination, as a department of public health work, in the hands of the proper authority, *i.e.* the sanitary authority, under the superintendence of the Medical Officer of Health, instead of under the guardians of the poor, as at present. Moreover, the certificate of success should state definitely the number of vesicles produced. At present there is no definition of what is a suc-

cessful vaccination ; any sort of vaccinal effect on the arm being regarded as a success. This should be altered, and the certificate of success should be given, not by the operator, but by a public official, as the Medical Officer of Health.

If these suggestions were strictly carried out and re-vaccination were made compulsory, we might then hope even to realise Jenner's dream of the utter extinction of small-pox in the country.

SUMMARY OF CONCLUSIONS.

1. Small-pox in its natural state is one of the most loathsome and terrible of human diseases, attacking a whole population indiscriminately, and killing a very large proportion of those it attacks.

2. Those who recover remain for life disfigured by scars and pittings, are left consumptive, weakly, or maimed, and may either totally or partially lose their sight or hearing.

3. The characters of small-pox, when uncontrolled by vaccination, still remain the same, as is evidenced by the present mortality from it amongst unvaccinated persons.

4. Vaccination, without endangering the life of the individual submitted to it, and without diffusing any infection, entirely and permanently exhausts the susceptibility to small-pox in the vast majority of those in whom it has been properly performed.

5. The objections raised to vaccination have no foundation in fact, and are disproved by the whole of the evidence on the subject.

6. There are absolutely no grounds for the statement that vaccination introduces the matter of diseased animals and children into the blood of healthy children, or that vaccination is mainly derived from small-pox inoculation of calves and heifers, or that vaccination breaks the law forbidding inoculation. The lymph used in vaccination is

the product of the vaccine disease, and cannot of itself produce any other disease.

7. The whole current of medical opinion is against the hypothesis that vaccination renders persons more liable to other diseases than small-pox, or that it communicates other diseases; and this has been indorsed by a Committee of the House of Commons, after a most patient hearing of the anti-vaccinators. The increase of deaths from particular causes is in all probability due to the greater precision in the diagnosis and certification of fatal diseases, rather than to their actual greater fatality.

8. No case of syphilis caused by vaccination has ever been discovered by the Medical Department of the State during the twenty years that it has supervised the vaccination of the kingdom. Parents have obvious self-interested motives in ascribing the appearance of this disease in their children to the results of vaccination.

9. The danger, if there be any at all, of communicating in a properly performed vaccination any other infection than vaccinia, is so infinitesimally small that for all practical purposes it may be regarded as non-existent.

10. The small-pox death-rate has been greatly diminished since the introduction of compulsory vaccination. The small-pox fatality in England and Wales has declined, since the passing of the first compulsory Vaccination Act, to less than one half of that recorded before the passing of that Act.

11. In every epidemic of small-pox the proportion of unvaccinated persons attacked (relatively to their numbers) is very much larger than the proportion of vaccinated persons attacked. The number of attacks of persons efficiently vaccinated and successfully re-vaccinated is extremely small.

12. The degree of severity which post-vaccinal small-pox may manifest is chiefly determined by the perfection of character and the sufficiency of amount of the vaccination that has been performed. Even when the vaccination has been most imperfect, leaving but a single mark of indifferent character, the disease is still in most instances modified in its course, and is not fatal in one third the proportion of cases in which natural small-pox is fatal.

13. When the vaccination has been done in the best-known manner, the modification is so general and so great that the proportion of deaths to attacks is scarcely more than one seventieth part of that which occurs in the natural disease.

14. In cases where the vaccination in early life has been but imperfectly performed, or has been from any other cause but imperfectly successful, the protection against small-pox neither lasts so long nor, while it lasts, is nearly so complete as the protection which first-rate vaccination gives. It is therefore advisable and prudent that all persons who have been vaccinated in infancy should, as they approach adult life, undergo re-vaccination.

15. Re-vaccination, once properly and successfully performed, does not appear ever to require repetition, and is an almost absolute protection against small-pox. By universal re-vaccination, small-pox has been virtually stamped out of the army and navy.

16. A strict enforcement of vaccination in early infancy, and a general system of re-vaccination at puberty, with scrupulous care as to the complete and perfect performance of the operation, would reduce to an insignificant fraction of its present amount the still considerable small-pox mortality of this kingdom.

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APPENDICES.

APPENDIX A.

INSTRUCTIONS FOR VACCINATORS UNDER CONTRACT.

(Prescribed by the Order of the Privy Council, July 29, 1871.)

1. Except so far as any immediate danger of small-pox may require, vaccinate only subjects who are in good health. As regards infants, ascertain that there is not any febrile state, nor any irritation of the bowels, nor any unhealthy state of skin; especially no chafing or eczema behind the ears, or in the groin, or elsewhere in folds of skin. Do not, except of necessity, vaccinate in cases where there has been recent exposure to the infection of measles or scarlatina, nor where erysipelas is prevailing in or about the place of residence.

2. In all ordinary cases of primary vaccination, if you vaccinate by separate punctures, make such punctures as will produce at least four separate good-sized vesicles, not less than half an inch from one another; or, if you vaccinate otherwise than by separate punctures, take care to produce local effects equal to those just mentioned.

3. Direct care to be taken for keeping the vesicles uninjured during their progress, and for avoiding afterwards the premature removal of the crusts.

4. Enter all cases in your Register on the day when you vaccinate them, and with all particulars required in the Register up to column 9 inclusive. Enter the results on the day of inspection. Never enter any results which have not been inspected by yourself, or your legally qualified deputy. In cases of primary vaccination, register as 'successful' only those cases in which the normal vaccine vesicle has been produced; in cases of re-vaccination, register as 'successful' only those cases in which either vesicles, normal or modified, or

papules surrounded by areolæ, have resulted. When the vaccination of an unsuccessful case is repeated, it should be entered as a fresh case in the Register.

5. Endeavour to maintain in your district such a succession of cases as will enable you uniformly to vaccinate with liquid lymph directly from arm to arm; and do not, under ordinary circumstances, adopt any other method of vaccinating. To provide against emergencies, always have in reserve some stored lymph; either *dry*, as on thickly-charged ivory points, constantly well protected from damp; or *liquid*, according to the method of Dr. Husband, of Edinburgh, in fine, short, uniformly capillary (not bulbed) tubes, hermetically sealed at both extremities. Lymph, successfully preserved by either of these methods, may be used without definite restriction as to time; but with all stored lymph caution is necessary, lest in time it have become inert, or otherwise unfit for use. If, in order to vaccinate with recent liquid lymph, you convey it from case to case otherwise than in hermetically-sealed capillary tubes, do not ever let more than eight hours intervene before it is used.

6. Consider yourself strictly responsible for the quality of whatever lymph you use or furnish for vaccination. Never either use or furnish lymph which has in it any, even the slightest, admixture of blood. In storing lymph, be careful to keep separate the charges obtained from different subjects, and to affix to each set of charges the name, or the number in your Register, of the subject from whom the lymph was derived. Keep such note of all supplies of lymph which you use or furnish, as will always enable you, in any case of complaint, to identify the origin of the lymph.

7. Never take lymph from cases of re-vaccination. Take lymph only from subjects who are in good health, and, as far as you can ascertain, of healthy parentage; preferring children whose families are known to you, and who have elder brothers or sisters of undoubted healthiness. Always carefully examine the subject as to any existing skin disease, and especially as to any signs of hereditary syphilis. Take lymph only from well-characterised, uninjured vesicles. Take it (as may be done in all regular cases on the day week after vaccination) at the stage when the vesicles are fully-formed and plump, but when there is no perceptible commencement of areola. Open the vesicles with scrupulous care to avoid drawing blood. Take no lymph which, as it issues from the vesicle, is not perfectly clear and transparent, or is at all thin and watery. From such a vesicle as vaccination by puncture commonly produces, do not, under ordinary

circumstances, take more lymph than will suffice for the immediate vaccination of five subjects, or for the charging of seven ivory points, or for the filling of three capillary tubes; and from larger or smaller vesicles take only in like proportion to their size. Never squeeze or drain any vesicle. Be careful never to transfer blood from the subject you vaccinate to the subject from whom you take lymph.

8. Scrupulously observe in your inspections every sign which tests the efficiency and purity of your lymph. Note any case wherein the vaccine vesicle is unduly hastened or otherwise irregular in its development, or wherein any undue local irritation arises; and if similar results ensue in other cases vaccinated with the same lymph, desist at once from employing it. Consider that your lymph ought to be changed, if your cases, at the usual time of inspection on the day week after vaccination, have not, as a rule, their vesicles entirely free from areolæ.

9. Keep in good condition the lancets or other instruments which you use for vaccinating, and do not use them for other surgical operations. When you vaccinate, have water and a napkin at your side, with which invariably to cleanse your instrument after one operation before proceeding to another.

July 29, 1871.

(Signed)

JOHN SIMON.

APPENDIX B.

VACCINATION PROSECUTIONS.

Letter from the Local Government Board to the Guardians of the Evesham Union.

Local Government Board, Whitehall, S.W.,
September 17, 1875.

SIR,—I am directed by the Local Government Board to acknowledge the receipt of your letter of the 7th instant, in which, with reference to the refusal of Mr. H—— of Broadway, to have his infant child vaccinated, you enquire whether the guardians of the Evesham Union have, under the Vaccination Acts, any discretionary powers to

abstain from taking further legal proceedings against persons who have once been fined for not complying with the law by having their children vaccinated.

The Board, in reply, direct me to state, for the information and guidance of the guardians, their views upon the question generally in connection with the law on the subject.

It is distinctly contemplated by Article 16 of the Board's General Order of October 31, 1874, that, independently of any proceedings which may be taken against the person in default, under Section 29 of the Vaccination Act, 1867, the vaccination officer shall be authorised to take proceedings against him if he continue contumacious, at least once also under Section 31 of that Act. Until, therefore, proceedings under the latter section have been taken in a case and a conviction obtained, the Board consider that the several means, which the law provides with a view to ensure the vaccination of a child, have not been used. The Board would here observe that, from the information in their possession, it is not clear whether all the means above alluded to have been resorted to in the case of Mr. H——.

The Board at the same time direct me to point out that by Article 16 of their above-mentioned Order it is provided that in any case in which a magistrate's order has been obtained, and summary proceedings have been taken under Section 31 of the Vaccination Act, 1867, no further proceeding shall be taken by the vaccination officer without the express instructions of the guardians.

The intention of this provision is that the guardians should carefully consider with regard to each individual case the effect which a continuance of proceedings is likely to have in procuring the vaccination of the individual child, and in insuring the observance of the law in the Union generally.

The Board may further state that it is, on the one hand, undeniable that a repetition of legal proceedings has, in numerous cases, resulted in the vaccination of a child when such vaccination has not been procured by the previous proceedings; and it is therefore important, with the view of securing a proper observance of the law, that parents should be well assured that proceedings in case of non-compliance with its requirements will not be lightly discontinued. On the other hand, the Board are prepared to admit that, when in a particular case repeated prosecutions have failed in their object, it becomes necessary to carefully consider the question whether the continuance of a fruitless contest with the parent may not have a tendency to produce mischievous results, by exciting sympathy with

the person prosecuted, and thus creating a more extended opposition to the law.

The Board entertain no doubt that, in all cases of the kind in question, the guardians, having before them the preceding observations, will not fail to exercise the discretionary powers confided to them in the manner best calculated to give effect to the policy of the law.

(Signed) I am, &c.,
FRAS. FLETCHER,
Assistant Secretary.

(Parliamentary Paper, No. 110 of Session 1876.)

APPENDIX C.

TABLE I.—SMALL-POX MORTALITY.

England and Wales.

Year	Deaths from all causes	Deaths from small-pox	Death-rate from small-pox to one million living	
1838	342,760	16,268	1,064	The annual rate of mortality in England and Wales from small-pox averaged 420 per million living in the twelve years 1838-42 and 1847-53.
1839	338,984	9,131	589	
1840	359,687	10,434	663	
1841	343,847	6,368	400	
1842	349,519	2,715	168	
1843	346,445	Causes of death in England and Wales during the four years 1843-6 have not been abstracted.		
1844	356,933			
1845	349,366			
1846	390,315			
1847	423,304	4,227	246	
1848	399,833	6,903	398	
1849	440,839	4,644	264	
1850	368,995	4,665	263	
1851	395,396	6,997	396	
1852	407,135	7,320	409	
1853	421,097	3,151	174	
(Compulsory Vaccination.)				
1854	437,905	2,808	153	The annual rate of mortality from small-pox in England and Wales averaged 208·5 per million living during the twenty-six years 1854-79.
1855	425,703	2,525	136	
1856	390,506	2,277	121	
1857	419,815	3,936	206	
1858	449,656	6,460	335	
1859	440,781	3,848	197	
1860	422,721	2,749	140	
1861	435,114	1,320	66	
1862	436,566	1,628	81	
1863	473,837	5,964	293	
1864	495,531	7,684	373	
1865	490,909	6,411	309	
1866	500,689	3,029	144	
1867	471,073	2,513	118	
1868	480,622	2,052	96	
1869	494,828	1,565	72	
1870	515,329	2,620	118	
1871	514,879	23,126	1,024	
1872	492,265	19,094	833	
1873	492,520	2,364	102	
1874	526,632	2,162	92	
1875	546,453	950	40	
1876	510,315	2,408	100	
1877	500,496	4,278	175	
1878	539,574	1,856	75	
1879	528,194	548	22	

APPENDIX D.

TABLE II.—TABLE SHOWING THE ANNUAL MORTALITY FROM SMALL-POX IN ENGLAND, WITH THE PROPORTION OF DEATHS TO POPULATION AND TO TOTAL MORTALITY, FROM 1838 TO 1877 INCLUSIVE.

Year	Population	Deaths from all causes	Deaths from small-pox	Deaths from small-pox per million of population	Deaths from small-pox per 1,000 deaths from all causes	Place occupied by small-pox in the order of mortality of the causes of death in England
1838	15,312,256	342,760	16,268	1,064	47.96	5th
1839	15,515,296	338,984	9,131	589	26.93	10th
1840	15,721,029	359,687	10,434	663	29.00	9th
1841	15,929,492	343,847	6,368	400	18.51	14th
1842*	16,123,793	349,519	2,715	168	7.76	25th
1847*	17,150,018	423,304	4,227	246	10.05	22nd
1848	17,356,882	399,833	6,903	398	17.32	16th
1849	17,564,656	440,839	4,644	264	10.53	20th
1850	17,773,324	368,995	4,665	263	12.90	19th
1851	17,982,849	395,396	6,997	396	18.00	15th
1852	18,193,206	407,135	7,320	409	18.28	17th
1853	18,404,368	421,097	3,151	174	7.60	26th
1854	18,616,310	437,905	2,808	153	6.49	29th
1855	18,829,000	425,703	2,525	136	6.01	34th
1856	19,042,412	390,506	2,277	121	5.90	35th
1857	19,256,516	419,815	3,936	206	9.48	24th
1858	19,471,291	449,656	6,460	335	14.54	18th
1859	19,686,701	440,781	3,848	197	8.84	26th
1860	19,902,713	422,721	2,749	140	6.59	35th
1861	20,119,314	435,114	1,320	66	3.06	46th
1862	20,371,013	436,566	1,628	81	3.77	39th
1863	20,625,855	473,837	5,964	293	12.70	21st
1864	20,883,889	495,531	7,684	373	15.64	18th
1865	21,145,151	490,909	6,411	309	13.20	21st
1866	21,409,684	500,689	3,029	144	6.11	30th
1867	21,677,525	471,075	2,513	118	5.38	36th
1868	21,948,713	480,622	2,052	96	4.30	40th
1869	22,223,299	494,828	1,565	72	3.18	47th
1870	22,501,316	515,329	2,620	118	5.12	37th
1871	22,782,812	514,879	23,126	1,024	45.20	8th
1872	23,067,835	492,265	19,094	833	39.07	9th
1873	23,356,414	492,250	2,364	102	4.83	40th
1874	23,648,609	526,632	2,162	92	4.13	44th
1875	23,944,459	546,453	950	40	1.74	63rd
1876	24,244,010	510,315	2,408	100	4.74	39th
1877	24,547,309	500,498	4,278	175	8.57	26th

* From 1843-46 inclusive the causes of death were not analysed by the Registrar-

APPENDIX

TABLE III.—SMALL-POX MORTALITY IN ENGLAND AND WALES AT

Year	Estimated Population in the middle of each Year				
	All ages	0-5	5-10	10-20	20 and upwards
1847	17,150,018	2,256,073	2,022,318	3,537,895	9,333,732
1848	17,356,882	2,280,845	2,041,493	3,573,901	9,460,643
1849	17,564,656	2,305,650	2,060,636	3,609,899	9,588,471
1850	17,773,324	2,330,486	2,079,743	3,645,889	9,717,206
1851	17,982,849	2,355,346	2,098,808	3,681,859	9,846,836
1852	18,193,206	2,389,496	2,123,639	3,718,632	9,961,439
1853	18,404,368	2,423,903	2,148,553	3,755,401	10,076,511
1854	18,616,310	2,458,561	2,173,541	3,792,156	10,192,052
1855	18,829,000	2,493,468	2,198,603	3,828,894	10,308,035
1856	19,042,412	2,528,619	2,223,731	3,865,604	10,424,458
1857	19,256,516	2,564,011	2,248,926	3,902,280	10,541,299
1858	19,471,291	2,599,641	2,274,182	3,938,917	10,658,551
1859	19,686,701	2,635,505	2,299,493	3,975,501	10,776,202
1860	19,902,713	2,671,601	2,324,858	4,012,033	10,894,221
1861	20,119,314	2,707,920	2,350,262	4,048,491	11,012,641
1862	20,371,013	2,743,135	2,384,455	4,102,274	11,141,149
1863	20,625,855	2,778,797	2,419,133	4,156,757	11,271,168
1864	20,883,889	2,814,908	2,454,305	4,211,950	11,402,726
1865	21,145,151	2,851,480	2,489,979	4,267,862	11,535,830
1866	21,409,684	2,888,513	2,526,159	4,324,503	11,670,509
1867	21,677,525	2,926,014	2,562,855	4,381,881	11,806,775
1868	21,948,713	2,963,989	2,600,071	4,440,005	11,944,648
1869	22,223,299	3,002,443	2,637,818	4,498,887	12,084,151
1870	22,501,316	3,041,382	2,676,099	4,558,530	12,225,305
1871	22,782,812	3,080,814	2,714,932	4,618,952	12,368,114
1872	23,067,835	3,119,353	2,748,894	4,676,732	12,522,856
1873	23,356,414	3,158,372	2,783,279	4,735,230	12,679,533
1874	23,648,609	3,197,881	2,818,096	4,794,461	12,838,171
1875	23,944,459	3,237,881	2,853,347	4,854,437	12,998,794
1876	24,244,010	3,278,384	2,889,040	4,915,161	13,161,425
1877	24,547,309	3,319,394	2,925,179	4,976,642	13,326,094
1878	24,854,397	3,360,915	2,961,769	5,038,894	13,492,819

E.

VARIOUS GROUPS OF AGES IN EACH OF THE 32 YEARS 1847-78.

Deaths from small-pox in each year					Annual death-rate from small-pox to 1,000,000 living					Year
All ages	0-5	5-10	10-20	20 & up- wards	All ages	0-5	5-10	10-20	20 & up- wards	
4,227	3,114	527	211	375	246	1,380	261	60	40	1847
6,903	4,782	898	470	753	398	2,097	440	132	80	1848
4,644	3,146	672	294	532	264	1,364	326	81	55	1849
4,665	3,265	619	296	485	262	1,401	298	81	50	1850
6,997	4,869	919	440	769	389	2,067	438	120	78	1851
7,320	5,076	895	470	879	402	2,124	421	126	88	1852
3,151	2,164	386	196	405	171	893	180	52	40	1853
2,808	1,659	359	219	571	151	675	165	58	56	1854
2,525	1,323	335	216	651	134	531	152	56	63	1855
2,277	1,299	272	210	496	120	514	122	54	48	1856
3,936	2,335	638	273	690	204	911	284	70	65	1857
6,460	3,585	1,113	529	1,233	332	1,379	489	134	116	1858
3,848	2,247	478	359	764	195	853	208	90	71	1859
2,749	1,544	307	260	638	138	578	132	65	59	1860
1,320	723	140	132	325	66	267	60	33	30	1861
1,628	931	173	141	383	80	339	73	34	34	1862
5,964	3,267	622	520	1,555	289	1,176	257	125	138	1863
7,684	4,294	800	640	1,950	368	1,525	326	152	171	1864
6,411	3,262	647	598	1,904	303	1,144	260	140	165	1865
3,029	1,662	297	261	809	141	575	118	60	69	1866
2,513	1,370	211	211	721	116	468	82	48	61	1867
2,052	1,234	204	162	452	93	416	78	36	38	1868
1,565	892	191	116	366	70	297	72	26	30	1869
2,620	1,245	371	247	757	116	409	139	54	62	1870
23,126	7,770	3,440	3,013	8,903	1,015	2,522	1,267	652	720	1871
19,094	5,758	3,126	2,810	7,400	828	1,846	1,137	601	591	1872
2,364	587	322	354	1,101	101	186	116	75	87	1873
2,162	543	231	388	1,000	91	170	82	81	78	1874
950	271	96	158	425	40	84	34	33	33	1875
2,408	612	261	351	1,184	99	187	90	71	90	1876
4,278	1,056	478	659	2,085	174	318	163	132	156	1877
1,856	472	218	336	830	75	140	74	67	62	1878

APPENDIX F.

TABLE IV.—TABLE SHOWING THE CASES AND DEATHS FROM SMALL-POX AMONGST THE BRITISH TROOPS SERVING IN THE UNITED KINGDOM FOR EIGHTEEN YEARS (1859-76).

Year	Number of Troops	Cases of Small-pox	Deaths	Ratio per 10,000 of strength	
				Cases	Deaths
1859	71,715	175	7	24.4	0.97
1860	85,443	140	9	16.4	1.05
1861	88,955	51	4	5.7	0.45
1862	78,173	64	4	8.1	0.51
1863	75,945	123	6	16.2	0.79
1864	73,252	111	10	15.1	1.36
1865	72,999	84	6	11.5	0.80
1866	70,292	38	1	5.4	0.15
1867	63,904	31	1	4.8	0.16
1868	78,261	65	2	8.3	0.26
1869	73,764	9	0	1.2	0.00
1870	75,305	24	1	3.2	0.13
1871	92,667	213	24	23.0	2.59
1872	92,218	131	18	14.2	1.95
1873	88,957	10	1	1.1	0.11
1874	86,837	7	*	0.8	0.05*
1875	73,279	5	*	0.7	0.05*
1876	87,758	25	*	2.8	0.20*

* It is greatly to be regretted that the numbers of small-pox deaths, if any, for 1874, 1875, and 1876, and of cases and deaths for 1877, have not been published in the Blue Books of the Army Medical Department. The ratios of deaths in the last column are therefore estimated ratios only, based on the average proportion of cases to deaths for the previous fifteen years. For some years past the Army Medical Reports have given only the statistics of *Classes of Disease*, as 'Eruptive Fevers,' for example. Statistics of particular diseases, as small-pox, have ceased to be published, and the value of the reports for scientific purposes is immensely lessened in consequence. Attention has repeatedly been called to this matter in periodicals and reviews, but it is stated that the War Office objected to the expense entailed by printing the details of special diseases. If this be correct, I can only say that it appears to me a most lamentable piece of economy in an entirely wrong direction.

APPENDIX G.

TABLE V.—TABLE SHOWING THE CASES AND DEATHS FROM SMALL-POX IN THE BRITISH NAVY EMPLOYED ON THE HOME FORCE FOR TWENTY YEARS (1859-78).

Year	Mean Strength	Cases of Small-pox	Deaths	Ratio per 10,000 of strength	
				Cases	Deaths
1859	19,300	51	4	26.4	2.07
1860	23,500	84	12	35.7	5.10
1861	22,900	35	1	15.3	0.43
1862	20,760	8	1	3.8	0.48
1863	21,570	39	2	18.0	0.92
1864	19,630	199*	9*	101.3	4.58
1865	20,980	18	0	8.6	0.00
1866	21,200	29	0	13.7	0.00
1867	21,600	30	0	13.9	0.00
1868	23,200	16	0	6.9	0.00
1869	22,100	8	0	3.6	0.00
1870	21,000	24	0	11.4	0.00
1871	22,100	67	4	30.3	1.81
1872	23,000	62	9	26.9	3.91
1873	22,400	7	0	3.1	0.00
1874	22,500	2	0	0.9	0.00
1875	21,600	1	0	0.4	0.00
1876	20,800	0	0	0.0	0.00
1877	21,000	2	0	0.9	0.00
1878	19,000	4	0	2.1	0.00

* This remarkable return, being so greatly heavier than any other year, needs a word of explanation. No fewer than three-quarters of the cases (151), and two-thirds of the deaths (6) were from infection at Portsmouth, where the very large number of 228 deaths from small-pox occurred in 1864. Nor was this all. From infection traced to Portsmouth the disease manifested itself on board the *Duncan*, when on its voyage for the North American station; 38 men were temporarily disabled by it, and 1 died.

MEMORANDUM

TO THE HONORABLE SECRETARY OF THE INTERIOR
 FROM THE COMMISSIONER OF THE BUREAU OF LANDS
 SUBJECT: [Illegible]

[Illegible]		[Illegible]		[Illegible]	
[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]	[Illegible]
100	100	1	10	100	100
200	200	2	20	200	200
300	300	3	30	300	300
400	400	4	40	400	400
500	500	5	50	500	500
600	600	6	60	600	600
700	700	7	70	700	700
800	800	8	80	800	800
900	900	9	90	900	900
1000	1000	10	100	1000	1000
1100	1100	11	110	1100	1100
1200	1200	12	120	1200	1200
1300	1300	13	130	1300	1300
1400	1400	14	140	1400	1400
1500	1500	15	150	1500	1500
1600	1600	16	160	1600	1600
1700	1700	17	170	1700	1700
1800	1800	18	180	1800	1800
1900	1900	19	190	1900	1900
2000	2000	20	200	2000	2000
2100	2100	21	210	2100	2100
2200	2200	22	220	2200	2200
2300	2300	23	230	2300	2300
2400	2400	24	240	2400	2400
2500	2500	25	250	2500	2500
2600	2600	26	260	2600	2600
2700	2700	27	270	2700	2700
2800	2800	28	280	2800	2800
2900	2900	29	290	2900	2900
3000	3000	30	300	3000	3000
3100	3100	31	310	3100	3100
3200	3200	32	320	3200	3200
3300	3300	33	330	3300	3300
3400	3400	34	340	3400	3400
3500	3500	35	350	3500	3500
3600	3600	36	360	3600	3600
3700	3700	37	370	3700	3700
3800	3800	38	380	3800	3800
3900	3900	39	390	3900	3900
4000	4000	40	400	4000	4000
4100	4100	41	410	4100	4100
4200	4200	42	420	4200	4200
4300	4300	43	430	4300	4300
4400	4400	44	440	4400	4400
4500	4500	45	450	4500	4500
4600	4600	46	460	4600	4600
4700	4700	47	470	4700	4700
4800	4800	48	480	4800	4800
4900	4900	49	490	4900	4900
5000	5000	50	500	5000	5000

Very respectfully,
 [Illegible Signature]
 Commissioner of the Bureau of Lands



