VACCINATION :

ITS ORIGIN AND EFFICACY, AND THE NECESSITY OF
FURTHER LEGISLATIVE ENACTMENTS TO EXTEND
ITS PROTECTIVE POWERS.

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BEFORE I proceed to the subject of vaccination, I shall give a brief sketch of that terrible scourge from which, happily, it has long become a protection.

Of all the diseases that afflict the human body there is none more universal in its attack, more disgusting in its aspect, or more fatal in its results, than the natural small-pox; it is a morbid poison that turns into heaps of living corruption the victims it destroys, and when it destroys not, it seldom fails to mar the countenance of man with indelible marks of its frightful visitation.

It is a pestilence that spares neither country, nor sex, nor age, nor condition; and wherever it prevails as an epidemic, it sweeps the land like a "besom of destruction," and threatens to annihilate whatever of the human race lies in its way.

It appears that this disease took its rise in China, where it had existed for an incalculable period before it bent its course towards the western hemisphere, and to have been conveyed from China or India by trading vessels into Arabia, and thence in the sixth century by the Saracen army into Europe.

It seems certain that it could not have reached Palestine before the Christian era, or it would, in all probability, have been recorded in the healing pages of the gospel history.

Rhazes, an Arabian author, was the first to give a description of the small-pox; and it is believed that the disease made its primary appearance in England in the year A.D. 900.

"All authors," writes Dr. Gregory, "concur in representing the dreadful mortality occasioned by this pestilence wherever it appeared, and the constant terror which it everywhere excited. Never was this more strikingly manifested than early in the sixteenth century, when one of the successors of Columbus carried the disease to America; the record of the desolation that followed it, is painful to contemplate. It is stated on the authority of Spanish histories, that in a very short time after the infection reached Mexico, three millions and a half were destroyed by it in that kingdom."* Unhappily there is no proof wanting of the ravages of this desolating scourge in the history of every country into which it had found its way, and they continued uncontrolled for several hundred years.

The first method discovered for arresting the fatal progress of this pestilence was inoculation. It is difficult to state when and where the practice commenced. According to Dr. Good, "this mode of communicating the disease, like the natural disease itself, appears to have reached Europe from the

East, and especially from China, where, according to the statements of the Jesuits, it has been practised immemorially by perhaps the simplest and best means of communication that has hitherto been devised—that of a needle charged with the contagious matter of a pustule and introduced transversely under the cuticle. From China the discovery appears to have travelled into India and thence to Asia Minor.* Inoculation, according to Mr. Campbell, appears to be of high antiquity also in Africa. He states "that the natives have a tradition that they learnt the art from a people to the north-east, called 'Mahalatyela,' who ride upon elephants."†

It commenced at Constantinople in the year 1700; and Lady Mary Wortley Montagu, who had witnessed its success in that city, and amongst others in the case of her own son, introduced inoculation into London in 1721, and there submitted her daughter also to it, in order to encourage the practice. It is stated, however, in the "Philosophical Transactions,"‡ that for a long time previously to this, inoculation had been practised in some parts of Wales, and in the Highlands of Scotland, where small-pox was bought according to the custom of the eastern nations; but this knowledge was evidently confined to these secluded parts; for so entirely ignorant of it was the faculty in London, that before their consent could be obtained for its general adoption, seven criminals were subjected to the experiment, upon the understanding that their lives should be spared if it succeeded. They all recovered. Afterwards the Royal Family of George the First were inoculated; and this noble example was followed by the nobility. The practice, however, was at first reluctantly adopted by the people at large, and many years elapsed before it gained public confidence; but at length its success became evident, and it everywhere prevailed.

The result of inoculation was most extraordinary. Instead of one death out of every four, or twenty-five per cent. in the natural small-pox—which is the calculation—there was not more than one in five hundred in the inoculated, that is, provided great care was taken in selecting subjects fit for inoculation, and preparing them for it. But this can scarcely be taken as a correct calculation, as it does not include those who die of strumous disease, called into activity by the variolous poison; and of these there must be a considerable number.

Inoculation, however, did not effect any diminution in the amount of deaths from small-pox, for although few died of those that were inoculated, yet the constant current of inoculation became such a depository of the variolous poison as to be a source of contagion for those who were not inoculated; and thus the mortality was found to be even greater than it was before.

It has hitherto been impossible to explain why the artificial introduction of variolous matter into the system through a puncture of the skin, should so completely moderate its morbid development; and it is

* Elements of Medicine.

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* Study of Medicine.

† Travels in South Africa.

‡ Vol. xxxii., 1722-3.

singular that the same method should fail to moderate the severity of other zymotic diseases; but such is the fact. Dr. White in 1801, and Mr. Rosenfelt in 1807, inoculated themselves with the plague, and both fell victims to the experiment. The former died on the fourth, and the latter on the second day of the disease.

The next discovery that was made to take the place of small-pox was vaccination, the author of which was Dr. Jenner. This occurred towards the end of the eighteenth century, and in the following manner:—“While Jenner was at Sudbury, in Gloucestershire, he was surprised one day at hearing a countrywoman say that she could not take the small-pox because she had had the cow-pox; and upon inquiry he learned that it was a popular notion in that district, that milkers who had been infected with a peculiar eruption, which sometimes occurred on the udder of a cow, were completely secure against the small-pox. Jenner pursued the subject, and found, when in practice at Berkeley, that there were some persons, to whom it was impossible to give small-pox by inoculation, and that all these had had the cow-pox; but that there were others who had had cow-pox, and who had yet received small-pox. This, after much labour, led him to the discovery that the cow was liable to a variety of eruptions, of which one only had the power of guarding against small-pox, and that this, which he called the true cow pox, could be effectually communicated to the milkers at only one period of its course.

About the year 1780 the idea first struck him that the disease could be communicated first from the cow to the human body, and thence from one person to another. In 1788 he carried a drawing of the casual disease, as seen on the hands of milkers, to London, and showed it to Hunter, (who was his personal friend,) Cline, and others, but still none would either assist or encourage him. Scepticism or ridicule met him everywhere, and it was not till 1796 that he made the decisive experiment.

On the 14th of May, (a day still commemorated by an annual festival at Berlin,) a boy, aged 8 years, was vaccinated with matter taken from the hands of a milkmaid. He passed through the disorder in a satisfactory manner, and was inoculated for small-pox on the 1st of July following, without the least effect. Jenner then entered on an extensive series of experiments of the same kind, and in 1798 published his first memoir,—“An Inquiry into the Causes and Effects of the Variolæ Vaccinæ.” It excited the greatest interest, for the evidence in it seemed conclusive, yet the practice met with opposition as severe as it was unfair, and its success seemed uncertain, till a year had passed, when upwards of seventy of the principal physicians and surgeons in London signed a declaration of their entire confidence in it.*

From this time vaccination advanced with extraordinary rapidity. In 1801 six thousand persons had been vaccinated, by far the greater number of whom were tested with small-pox, and exposed to its infection in

every rational way that could be devised, without effect.

In 1799 the practice of vaccination was introduced into America through the agency of Dr. Waterhouse. In 1800 it was introduced into France. The earliest supporter of vaccination on the continent of Europe was Dr. de Carro, of Vienna, whose exertions in the cause were beyond all praise. Dr. Sacco, of Milan, distinguished himself, not merely as an active propagator of the new practice in Italy, but by his pathological investigations into the origin of cow-pox.

Great difficulties were experienced in transmitting vaccine lymph to India, but at length this object, so ardently desired by Jenner, was effected, through the ingenuity of Dr. de Carro. In June 1802 vaccine lymph, in an active state, reached Bombay, from the Persian Gulph, and was thence rapidly disseminated over the continent of India.* In short, it was not long before the prophylactic agency of vaccination was acknowledged and adopted throughout the civilized world.

In 1802 Jenner obtained from Parliament a grant of £10,000, and in 1807 an additional grant of £20,000, for the discovery he had made. Thus rewarded, and happy in the reflection that he had been an instrument in the hands of a merciful God, of bestowing a great blessing on his fellow men, he died at Berkeley, in Gloucestershire, in 1823.

In 1808 vaccination was taken under the patronage of the British Government, and a board was instituted, called the “National Vaccine Establishment,” which became a central depository for the supply of vaccine lymph to all parts of the kingdom.

Under such patronage confidence in vaccination was greatly increased; and it ought to be recorded to the praise of the upper ranks of society, that, as they were the first to submit their children to the experiment of inoculation, so they were also the first to confide in the protective power of the cow-pox. On the other hand, the lower classes were prejudiced against its adoption. These, either from the fact that the cow-pox is derived from a brute animal, and from the dread of its introducing bad humours into the constitution, or from its comparatively slight effect upon the system, and its not producing any cutaneous eruption, preferred inoculation at the hands of unqualified pest-mongers to vaccination from regular practitioners, (for by the latter inoculation was generally abandoned,) and thus inoculated small-pox was still extensively kept up throughout the kingdom.

In order to put a stop to this pernicious practice, Mr. Wakley, M.P. for Finsbury, caused an Act to be passed July 23rd, 1840, intitled “An Act to extend the Practice of Vaccination,” the principal clauses of which are the first, third, and eighth.

The first empowers guardians and overseers in England and Wales to contract with medical practitioners for the vaccination of all persons resident in their respective parishes, the amount of the remuneration to depend on the number successfully vaccinated.

* Cyclopædia for the Diffusion of Useful Knowledge. Article Jenner.

* See Encyclopædia of Practical Medicine. Art. Vaccination.

The third requires medical practitioners to report to guardians or overseers, from time to time, the number of persons vaccinated. The eighth is as follows:—“And be it further enacted, that any person, who shall from and after the passing of this Act, produce, or attempt to produce, in any person by inoculation with variolous matter, or by wilful exposure to variolous matter, or wilfully by any other means whatsoever, produce the disease of small-pox in any person in England or Wales, shall be liable to be proceeded against and convicted summarily before any two or more Justices of the Peace, in Petty Sessions assembled, and for every such offence shall, upon conviction, be imprisoned in the common gaol or house of correction for any term not exceeding one month.”

For this Act the public are much indebted to Mr. Wakley and the Legislature. It is undoubtedly a step in the right direction, and has done much good; but unfortunately, like most other human institutions, it has proved insufficient, for whilst it prohibits inoculation, it does not enforce vaccination, and the consequence is, that a large proportion of the lower classes, who are still strongly prejudiced against the cow-pox, have refused to have their children vaccinated, and left them to be exposed to the danger of taking the natural small-pox, as best they may, whensoever they may fall within the influence of its contagion.

During ten years since the passing of the Act, such perverse conduct has occasioned multitudes of unprotected children to be ready at any moment to light up a pestilence in all parts of the country. Nor is this a mere hypothesis. We have only to refer to the Registrar-General's Reports as evidence to prove that such a lamentable result has from time to time actually occurred throughout the land. The Registrar of Leicester says: “I have registered *fifty deaths* by small-pox from January 1st to June 30th, 1845, only *one* of the fifty persons had been vaccinated, and that was a doubtful case.”* Since the summer of 1849 I can myself state that various parts of Hampshire have severely suffered from variolous outbreaks, and that a large number of unprotected persons have been destroyed by the disease. Indeed, so long as the Act remains as it is, this evil is certain to recur again and again, for, as every variolous epidemic generally infects some that have been vaccinated, the prejudice against vaccination will of course increase, and with it the number of the unprotected, and thus the public will eventually become exposed to the ravages of the natural small-pox more and more extensive and destructive.

Previously to my suggesting any further measure to prevent so alarming a result, it will be but fair to examine the merits of the cow-pox:—1st. Whether its prophylactic efficacy can be explained upon any physiological principle? 2ndly. What is the amount of protective power it has to offer?

Jenner always entertained the opinion that cow-pox and small-pox were identical diseases; but its efficacy was at first taken for granted upon the bare fact that

the former, either when caught by milkers from the teat of the cow, or artificially conveyed into the system, was found to be a protection against the latter.

With a view to prove the supposed identity, Gassner, in 1807, first inoculated the cow with variolous matter, and thereby produced vaccine results. In 1836 Dr. Basil Thiele, of Kasan, in South Russia, was equally successful in the same experiment; and in 1839 Mr. Robert Ceely, surgeon to the Buckingham Infirmary, produced the same result in this country, and has written a most important paper on the subject in the eighth volume of the “Transactions of the Provincial Medical and Surgical Association.” He inoculated three heifers with small pox. In one there was no result; but in two he produced cow-pox. With lymph taken from these vesicles, he successfully vaccinated a great number of children through more than sixty removes; and the same lymph was used in the London Small-pox Hospital, in Dublin, in Bristol, and in Cheltenham, with the utmost satisfaction.

The success of these experiments led to a very general belief that the small-pox and cow-pox were one and the same disease.

Dr. Gregory, who has been for many years physician of the Small-pox Hospital in London, and whose opinion in eruptive diseases enjoys an European reputation, demurs to the theory of identity, and attributes the protecting power of vaccination to an antagonistic or anti-variolar principle.* But this difference of opinion does not in the least degree diminish the importance of the experiment; for it shows on the one hand that the two diseases are identical, or on the other that the blood of the cow has an antidotal power over the variolous poison, to prevent or modify its eruptive development, and therefore, that vaccination upon either of these principles is the more entitled to our confidence as a protection against small-pox.

We have next to inquire what amount of protection vaccination has to offer after an experience of half a century?

Jenner, in 1800, two years after its introduction, gave it as his decided opinion, that vaccination affords a *permanent security*—that is for life. He thus writes on this point:—“Some there are who suppose that the security from the small-pox, obtained through the cow-pox, will be of a temporary nature only. This supposition is refuted, not only by analogy with the habits of diseases of a similar nature, but by incontrovertible facts, which appear in great numbers against it.”† But twenty-seven years of vaccine experience since the death of Jenner, have so much the more qualified the pathologists of the present day to decide that proposition; and it must be confessed that, either from spurious, imperfect, or insufficient vaccination, or from the activity of epidemic variolous poison, this view has not hitherto been realized without considerable exertions. In different countries where vaccination has been adopted and extensively practised, many of the

* Registrar-General's Reports, spring quarter, 1845, in Vol. 47-48.

* Lectures on Eruptive Diseases.

† Continuation of Facts and Observations.

vaccinated have been found susceptible of (for the most part) a modified small-pox during the several epidemics that have from time to time taken place; and in Great Britain cases of small-pox after vaccination, under similar circumstances, are not at all uncommon, but in the absence of variolous epidemics such failures are comparatively rare.

To state with any degree of accuracy what is the proportion of failures out of the amount of vaccinated persons is not possible, for the want of complete authorized registries of vaccination; and therefore we must be content with shewing the deaths from small-pox after vaccination, compared with the deaths of the unprotected. This I shall be enabled to do from tables in Dr. Gregory's excellent "Lectures on Eruptive Fevers,"—a work to which I am largely indebted for much information on the subject of this paper.

Comparing the average number of deaths from small-pox after vaccination, that have occurred in different parts of the world since the year 1826, with those from natural small-pox in the unprotected, it appears that the mortality of the former is five and a half per cent., and that of the latter from twenty-five to thirty per cent. The number of deaths, therefore, from natural pox in the unvaccinated, is five times greater than for small-pox after vaccination.

The analysis of 151 cases of small pox after vaccination in the London Small-pox Hospital gives the following interesting results, shewing the proportions of the normal to the abnormal or modified disease:—

Normal—56	Confluent	25	—	8	Deaths 9
	Semi-confluent	19	—	0	
	Distinct	12	—	1	
Abnormal—95 ..	Confluent and modified	18	—	0	" 1
	Semi-confluent modified	19	—	1	
	Varicelloid or distinct	58	—	0	

Making the deaths a fraction more than six per cent.

These statements alone are sufficient to prove the efficacy of vaccination in diminishing the mortality and modifying the character of the variolous poison; but when we contemplate the vast multitudes throughout the world, which up to this moment have been exempted from it by virtue of vaccination, numbers of whom must have been frequently exposed to its contagion in various relations and capacities, the amount of vaccine protection is astounding and exceeds calculation. Inoculation may truly be said to have saved its thousands; but vaccination has saved its millions, and most justly demands our gratitude to "the Father of all Mercies," for such an inestimable blessing!

With such a prophylactic remedy in our possession, it becomes a serious duty to consider what is the best method of making it more successful in preventing the frequent recurrence and spread of small-pox?

If pestilential cholera have obtained so much attention and aid from the Legislature, surely the ravages of a far worse pestilence ought not to be disregarded.

It appears to me that the most effectual means of preventing the outbreaks of small-pox, will be to amend the 3rd and 4th of Victoria, and enforce the practice of vaccination upon the very same principle that prohibits inoculation.

With this view I propose that a clause should be

added to the effect:—That every father or mother shall cause each of their children to be vaccinated before the age of one year, by a legally-qualified medical practitioner, and shall, before the expiration of twenty-eight days from the date of the vaccination, deliver or cause to be delivered to the registrar of the district, a certificate of such vaccination signed by the vaccinator, stating the name, age, and residence of the child vaccinated,—the number of vesicles,—whether normal or abnormal,—their effect upon the system, and any other remarks that may be deemed necessary. And if the father or mother be incapable of so doing from death, illness or absence, &c., then that the relative or person taking charge of such child shall cause the same to be vaccinated and registered in the manner aforesaid. In default, such penalty as the Legislature shall deem fit.

No valid reason can be urged against such a legislative proceeding.

It will in future put all classes of society upon an equal footing as regards protection, and prevent those who have confided in vaccination, being exposed to small-pox so frequently as they are at present from the unprotected, who take the natural disease. It will involve the public in scarce any additional expenses or trouble, for the machinery now employed for the registration of births, deaths, and marriages, can be readily adapted for the registration of vaccination. It will provide authorized statistic reports, that will show the real amount of vaccine protection, thus measuring the degree of confidence it deserves; and, above all, I am persuaded it will effect the grand object in view—that of gradually diminishing and eventually preventing the variolous outbreaks, which of late have so seriously increased.

The following fact communicated to me by Mr. Dayman, Surgeon, of Millbrook, is too important to be omitted in this place. This gentleman has for seven years officially attended the poor of the parish of Nunling, in this county, the population of which is about one thousand, and during his appointment he has been enabled to vaccinate the whole of the unprotected, with the exception of a very few—prejudiced against vaccination. In every district surrounding this parish, epidemic small-pox has within the last year extensively prevailed—viz., at Eling, Romsey, Shorles, and Southampton—and yet Nunling has been almost wholly exempted from the disease, the only persons affected by it being those few who had objected to be vaccinated.

Mr. Samuel S. Dyer, of Ringwood, has also favoured me with an interesting analysis of twenty cases of small-pox which have taken place in that town.

The disease was imported on the 13th of June last, by a lad aged 15 years, who was brought from Southampton or Romsey; it gave rise to the above number of cases, and would, probably, have extensively spread, had not the medical gentlemen of the locality been at once active in vaccinating *several hundreds* of the unprotected poor, which completely checked its progress. Of the twenty cases thirteen had been previously vaccinated, one of them, a man 81 years of age, as long as thirty-two years ago, and seven were unpro-

tected. In the former, the disease, for the most part, was modified, and all recovered; of the latter, five died and two recovered.

The lad who first communicated the disease was the eldest of ten children, and the nine, being unprotected, were set apart and vaccinated. The youngest, nine months old, took the small-pox heavily, but recovered, (probably,) under the antagonistic influence of the vaccine vesicles fully developed on the arms. The remaining eight resisted the contagion, although they were shut up with the infant to nurse and amuse it.

Mr. George Nunn, of Lyndhurst, informs me that the small-pox has been severe in that neighbourhood, and that the deaths which have occurred have taken place in those who objected to vaccination.

Such facts as these, (and the same kind of evidence could be adduced *ad infinitum* by every medical man,) incontestably prove, as I think, the absolute necessity of vaccination being legally enforced throughout the land.

Another means of extending the efficacy of vaccine protection is, a more implicit attention to what is called the surgery of vaccination.

1st.—No lymph should be taken from a vesicle after it has begun to lose its transparent character, *i.e.*, after the eighth day, and when practicable it should be at once communicated.

2nd.—The puncture should be made by carrying the point of a lancet, held flat to the arm, obliquely downwards through the cuticle into the surface of the cutis, and whatever instrument be used to apply the lymph, it should remain inserted a few seconds, and then be wiped upon the orifice.

3rd.—Six punctures *at the least* should be made, either on the arms or on different parts of the body, for is it not improbable that many vaccinations have failed as a protection from not having made a sufficient prophylactic impression upon the system. The same result occurs in other blood diseases, and why not in this? For example, in scarlet fever and measles. If the blood in either of these be not sufficiently impregnated by the first attack, the constitution has been found susceptible of a second. I have seen six or seven punctures adroitly made by an experienced vaccinator in three or four seconds of time, but as these are apt to result in a *confluent* cluster of vesicles, the more deliberate method is to be preferred.

4th.—Where the vaccination has resulted in a single vesicle, it ought not to be disturbed; and it may sometimes be satisfactory to try its efficacy by the test of Mr. Bryce, introduced in 1802. It is this:—Re-insert vaccine lymph on the evening of the fifth, or morning of the sixth day; and if the second vesicles, which of course will be comparatively small, grow rapidly, overtake the first, and the whole scab together, it will prove the blood to be impregnated by the first vaccination.* And where there are more than one vesicle, if their development should not be satisfactory, Bryce's test will be equally required.

5th.—The vesicles should be guarded against accident, attentively inspected during their progress, and any irregularity be accurately noted.

Having thus pointed out what I consider to be the best means of fully carrying out the efficacy of vaccination, it seems right briefly to inquire if there be any method of proving the constitution to be still under its protection, especially when exposed in after-life to the contagion of small-pox?

The only thing that can help us under a feeling of uncertainty is re-vaccination, but this need not be employed till after the expiration of eight years from the primary vaccination, as, according to Dr. Gregory, its protective power has hardly ever been found to fail for that period of time. Recent active lymph should be used for this purpose, and conveyed at once from arm to arm, in order that *some kind of action* may be produced. If it occasion local irritation, even to a considerable extent, without any *specific* character, the constitution may be considered still under vaccine protection; but if it result in the development of a normal vaccine vesicle, especially if proved to be such by Bryce's test, it may fairly be inferred, on the other hand, that the primary vaccination had ceased to be a protection.

Re-vaccination in the above point of view is of considerable value, and until the efficacy of one vaccination, like one inoculation, can be confided in as a permanent security, it will undoubtedly be right that vaccinated persons, whenever exposed in after life to the contagion of small-pox, should submit to this test. Medical men more particularly require it, and at reasonable intervals of time.

Lastly, it is a popular notion, that vaccine lymph, from having passed through such a lengthened chain of the human race, must necessarily have degenerated, and, in great measure, have lost its prophylactic power. There is nothing unreasonable in such an apprehension on the part of the community; in fact some currents of lymph have been found to degenerate, and have, therefore, been abandoned. If ever the *general* current of lymph should become degenerated, and unsatisfactory in its developments, there would certainly be a necessity to derive it afresh from the teats of the cow. Retro-vaccination—that is, passing the failing lymph again through the blood of the animal, would not renew it, nothing short of a new supply from the primary disease could suffice. But such a general degeneration has not happily been experienced, and so long as the humanised vaccine vesicle presents its normal character, it will need no renewal, though it shall have passed through a thousand generations.

Southampton, March 4, 1850.

* See Gregory's Lectures.