

arrived in a previously healthy place, and that the disease has soon after spread in that place? *Secondly*—Has the disease extended in proportion to the intercourse between the healthy and unhealthy? *Thirdly*—Has such disease prevailed more among persons who devoted themselves to its alleviation as medical men, nurses, and the friends of the sick? *Fourthly*—Is there any other cause to which the disease may reasonably be attributed? *Fifthly*—Has immunity been obtained by seclusion, and avoiding communication with the sick? *Sixthly*—Have the healthy become affected with the malady soon after proximity to, or contact with a person labouring under a similar one? I cannot help thinking, that viewed under these several lights the evidence preponderates on the side of infection. I cannot, neither do I wish to deny, that there are difficulties in the infectious hypothesis, but would merely observe, that not only on this but on every other point connected with physical science, scepticism can easily propose many more questions than philosophy can answer.

ART. III.—*On the protective Power of Vaccination.* By
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Two periods of twenty years have nearly passed away since Jenner's great discovery began to be adopted amongst us. The hesitation with which so great a novelty may have been received by rational minds, when first presented to them, quickly yielded to the proof by which it was sustained. The groundless fears of fanciful objectors soon ceased even to furnish matter for derision. The rare, invincible opponent was awed into silence, and vaccination, in a very short time after it was laid before the world by Dr. Jenner, being embraced every where as a deliverer from a dreadful scourge, ceased to encounter opposition. Notwithstanding the inestimable value of such a discovery, much carelessness has marked its use

in the upper classes, and in the lower, ignorance, apathy, prejudice, and superstition have prevented it even yet from becoming universal. Small-pox, propagated amongst the latter by itinerant inoculators, and communicated likewise by other means, unnoticed or unknown, becoming from time to time epidemic, involved many of the vaccinated in its contagion, producing, in several, anomalous febrile eruptions more or less resembling its own characters, and in some genuine variola. Towards the close of the first period, in 1817, 18, and 19, those cases had become so numerous, that in society at large not a little anxiety began to be felt, lest the confidence with which cow-pock had been regarded as a protector against a horrible disease, should ultimately prove fallacious; and the attention of medical men, directed by no less anxious feelings, being early drawn to them, they furnished matter for much professional discussion, public and private. The characters of genuine small-pox could not be mistaken. On this point there could be but little difference of opinion; and the fact that it did sometimes occur after perfect vaccination was, on the lapse of a period capable of furnishing proof, sufficiently established. But the nature of those other and much more numerous cases resembling it, yet differing much from it and from each other, did not admit at once of such decisive evidence. The variance in medical opinions on this subject, and the want of accordance frequently observable in the descriptions given to the public by those who wrote on such diseases, then as well as previously, can be adequately accounted for, and is satisfactorily explained by the admission that the contagion of small-pox is capable of producing a great variety of eruptive attacks, according to the susceptibility of the individuals liable to be in any way influenced by it: commencing with red spots analogous to the earliest discolorations of variola, but soon disappearing, comprising all those eruptions to which the term *varicella* properly belongs, and ending in the pestilential disease itself. This view was, to its full extent, maintained by Dr. John Thompson, and partly by Mr. Cross

in his valuable work on the variolous epidemic which visited Norwich in 1819. It was the conclusion formed by myself, about that time, from my own observation alone, and it has been confirmed by subsequent experience. I believe it to be now generally received by the members of the medical profession.

Any thing like a correct estimate of the protecting power of cow-pock, either positively or in comparison with small-pox, could not be made without a previous decision on this question. That decision being formed, there did not appear to be any difficulty in coming to a conclusion on the main subject, and at the close of the first period of twenty years, the following propositions were considered to be established respecting cow-pock.

1. That in a great majority of the vaccinated, it is a perfect protection against small-pox.

2. That in a small minority, it is but a partial protection, leaving them susceptible of small-pox in some of the various grades of its modified forms.

3. That in a few individuals, it is no protection at all.

The extensive examination which these matters received, not only enabled us to arrive at the foregoing positions in relation to cow-pock, but also brought to light a similar condition in those who have passed through variola, either casually or by inoculation ; with this difference, however, that the minority partially susceptible is smaller, and the individuals entirely unprotected fewer, than in the case of cow-pock.

If these facts did not realize all that was hoped for, neither did they furnish ground for serious disappointment. The modified small-pox which occurs after cow-pock, is devoid of danger, and its occurrence unmodified is rare. During twenty years in which I have been a member of the medical profession, having had a large establishment under my medical care for thirteen years, I have not seen more than five cases of perfect post-vaccine variola, if so many. I have witnessed but one fatal case, and I can call to mind only two more, in this city,

of which I have heard. In one of the latter some doubt has been expressed respecting the genuineness of the vaccination. During the same period I attended a gentleman under genuine small-pox, which he had also early in life by inoculation. He had several children who had been vaccinated, and none of them took the disease from him. I visited likewise a servant man who was thickly covered with the eruption, modified, however, as the pustules were in different states of advancement. This man told me he had had small-pox naturally. And in my Registry at the Foundling Hospital I have recorded one case, in which the character of the cicatrix in the arm of a child attacked by the disease, corresponded with that left by inoculation. I am not without suspicion that I might count another instance of this kind which I put down hastily as a case of imperfect vaccination. In neither of these last was the disorder at all modified.

Precision of language belongs to correct reasoning: the term secondary small-pox, implies its recurrence, and should be confined to that meaning; when it follows vaccination, that is adequately expressed by the epithet post-vaccine, whether modified or otherwise; and the name varicella (*variola varicella*) may still be used to designate its incomplete forms occurring before either.

The modified post-vaccine variola being a mild disease, and its modifications constituting an overwhelming majority, it follows, that the mortality is exceedingly small. The physician of the Small-pox Hospital of London has recently reported it to be seven per cent. on cases of *reputed* vaccination. I can well believe, that the mortality of small pox in that hospital is twenty-seven per cent. (it has been forty-one) for that accords with the nature of the disease, and is not contradicted by general experience. The small register which I subjoin, excluding the post-vaccine cases, gives one death in seven. If there be any considerable mortality of true post-vaccine variola there recorded (it should not be estimated by that of reputed cases) there must be such qualifying circumstances as will entirely prevent the adoption or application of that ratio any

where else. Very mild cases would scarcely seek admission into that establishment, or into any such, and any disease exciting smart fever, especially of the eruptive kind, in the pauper population of a great city, would produce deaths not likely to occur elsewhere. When inoculation with small-pox was at its height, it was estimated that 36,000 perished by the disease annually in the United Kingdom. The population of the United Kingdom was not then what it is now, and would not now be what it is, admitting every other cause, but for vaccination. Men of renown, from Sesrostis to Napoleon, may contest the honour of having destroyed the greatest number of human lives, and in vain might an assembled world labour to adjudicate; to the question, who saved the greatest number, there is but one answer, Jenner. I estimate the mortality of post-vaccine variola to be about equal to that directly following inoculation with small-pox. The multitudes of the perfectly protected are, therefore, in one sense or other, so much clear gain. They occupy the place not only of persons who would perish by casual small-pox, and of those preserved by inoculation, but, adding the partially protected, of those who might recover from a disease which sweeps away from one-sixth to one-half of the unprotected whom it invades, and inflicts suffering on all, and deformity on many, what an immense disproportion between the mortality of casual small-pox and that of inoculation! There is a much greater disproportion between the latter, and that to which all the vaccinated are liable. It has, too, been well observed, that variolous inoculation preserves the few, but sacrifices the many, so that the practice is not separable, even in our reasonings, from the horror of this pestilential disease.

The close of the second period of twenty years is now at hand, and the conclusions we formed at the termination of the first remain unshaken. No new facts have been developed, no information supplied, which would justify diminished confidence in cow-pock, or require any alteration of our opinions re-

specting it. An increase of post-vaccine variola (there has been no increase here) neither indicates a deterioration of the vaccine virus, as regards the many, nor a diminution of its protecting power, either gradually or at some definite age, as regards individuals. The vaccinated population of 1820 has been augmented by that of eighteen succeeding years. Supposing the same ratio of susceptibility and similar circumstances of exposure only, there should be a much greater number of variculous cases in the latter period than in the former. This increase ought to be expected for thirty years to come, (indeed longer, as vaccination is any thing but general amongst the poor,) for Jenner's discovery, practically speaking, is not yet forty years old, and it must reach the extreme term of human life, before it can include all ages. The allegations of an increase of post-vaccine variola are not founded upon data furnished by the United Kingdom, with the exception already alluded to, but by states, which, having the power of enforcing vaccination, had been more or less completely delivered from small-pox. Exactness of medical police would scarcely prevent a very general heedlessness, or want of attention, arising out of the general security, to the evidence which should be manifested of perfect vaccination in every individual case. One or two returns of the mortality in those instances give me a very strong impression that such has been more or less the fact. These data have also furnished occasion for putting forth an opinion ere now held and forgotten, that vaccination gives but a *temporary* protection. I know no analogy in the range of medical science which gives any support to such a notion. If there be any such analogy, I entirely overlook it. Whatever be the degree of protection afforded, it must be permanent. The escape of individuals after an exposure to contagion, and their being attacked on some other, at whatever interval, is perfectly reconcileable with this position, being in accordance with what we know of other communicable diseases; for the sum of the resistance at the one exposure being composed of the degree of

protection (an invariable quantity) and of the state of the constitution, together with external circumstances, (both continually varying,) we have in the latter an adequate cause of the different result. If a sufficient number of registers, carefully kept and correctly reported, should even establish as a fact, that a larger number of true post-vaccine cases occurs at some certain age than in any other, then various questions must be answered, before it can be justly accounted for—such as what lustrum, or definite period in human life, comprises the greatest number of the vaccinated in society, what age is most exposed to those varied conditions, internal and external, which furnish the fullest opportunity to receive the contagion of small-pox, and can alone prove complete exemptions. These and other questions must be answered, before we can infer a perfect anomaly. Calculations of this sort, even upon more certain data, are very liable to error. The injurious mistake of Dr. Watt ought not to be forgotten. Having examined the mortuary registers of Glasgow, he found that the ratio of deaths under the age of ten to the deaths in after life, increased instead of diminishing after the era of vaccination, and he came at once to the conclusion, that vaccination did not effect any ultimate saving of life; for that those preserved by it perished soon after by an increased virulence of other diseases, chiefly of measles. This error passed from one to another; arithmetic seemed to establish it, and it remained uncontradicted, until it was refuted by Mr. Robertson, of Manchester, who shewed that the ratio of the whole mortality to the population had been overlooked, and that there had indeed been a considerable saving of life.

A temporary protection, either for a definite period, or gradually diminishing with advance of years, is quite untenable. The probability of a deterioration in the protecting power of cow-pock, in the lapse of years, if transmitted unrenewed, through an indefinite series of human beings, is quite another matter. If the virulence of any contagious disease has abated in the course of time, (one instance at least will readily occur,)

how much more likely is that to take place, and how much sooner would it be developed in a disease so very easily interfered with as cow-pock ! That any such deterioration has yet taken place, there is no proof ; but that it will, soon or late, if not prevented, seems highly probable. Fortunately prevention is easy. The possibility of this deterioration, setting aside its probability, points out the expediency of a provision being made by the NATIONAL VACCINE INSTITUTION, for the renewal of the virus, within certain fixed periods. These periods may be arbitrarily chosen : they should not be short, because the virus must be carefully tested, neither should they be so long as to induce incautious persons to renew it for themselves. The managers of that Institution will, I hope, avail themselves of the example, if not of the assistance which Mr. Estlin, of Bristol, has laudably given them.

The register which I have kept at the Cork Foundling Hospital, of these diseases which occur but once in life, gives very satisfactory evidence of the protecting power of cow-pock. When measles appears within the walls, it spreads to every individual who may be liable to it. I know no instance of any child coming to the Infirmary with measles at one period, who had been in the house at its former visit, though one or two such instances might well occur. Small-pox is not less contagious than measles, and I am therefore justified in concluding, that those who escaped it within the walls, were not susceptible of it, except perhaps two or three in a very low degree. Judging from my experience in the Foundling Hospital, I would say, that these two diseases are equal as to contagious power. The following is the sum of

The Small-pox Register.

	SEX.	CASES.	DEATHS.	POST-VAC.	DEATHS.
1829.	Males, . .	12	1	„	„
	Females, . .	12	„	„	„
	Total, .	24	1	„	„
1831.	Males, . .	11	1	„	„
	Females, . .	17	2	1	„
	Total, .	28	3	1	„
1834.	Males, . .	32	5	„	„
	Females, . .	30	2	2	„
	Total, .	62	7	2	„
1836.	Males, . .	7	1	„	„
	Females, . .	11	1	3	„
	Total, .	18	2	3	„
1838-9.	Males, . .	13	3	5	„
	Females, . .	12	6	7	1
	Total, .	25	9	12	1

The result of the foregoing register is, that during five epidemics of small-pox there occurred only eighteen post-vaccine cases, of which one proved fatal. There are at present within the walls 240 vaccinated persons, including a few adults. To this number should be added all the vaccinated who passed through the house since 1829. The sum of these cannot now be ascertained. They must exceed 300, considerably, and may amount to 400; making the fullest allowance for an over estimate, and for the few who may have had post-vaccine variola whilst at nurse, the entire number of the vaccinated, amongst

whom these eighteen cases took place, is not less than 500. Of the eighteen, three only had perfect small-pox : one of the three, with two of the rest, had defective cicatrices. The fatal case seems to me to have been occasioned rather than caused by this disease. The patient died of sloughing of the mouth on the eighteenth day, giving every indication of recovery from small-pox apart from this, and leaving me in doubt, whether her death was the direct result of variola or was caused by a peculiar susceptibility towards mercury ; she had, however, taken no more than ten grains of calomel during the preceding part of her illness, combined with James's powder and rhubarb, and followed by purgatives. This child had been vaccinated by myself fourteen months previously, together with several others, and I observed on the eighth day, that the vesicles had been broken, on most of them, by their clothing. Of the remaining fifteen, two had merely papular eruptions, which disappeared on the third day : one of these, the son of the master of the house, was aged six years, and the other was an infant of one of the teachers ; a part of the rest had either a few pustules only, or a highly modified disease, and none an attack of any importance. They were all from the youngest children of the house, and the vaccination of these attacked by the last epidemic, was particularly recent. The progression in the post-vaccine column, 1, 2, 3, 12. may appear adverse to my assertion, that there has been no increase of post-vaccine variola in this quarter : that assertion I repeat with confidence. The augmentation of last summer is sufficiently explained by the mortality column of the same year. As the disease was unusually violent, so its contagious power was unusually great. There has been no increase of post-vaccine variola in this quarter since 1820. The most extensive vaccinator in this city is Dr. Kehoe, and his experience accords with mine. He informs me, too, that he never met a fatal case ; and that he has seen but one case where it was not modified. The fact that all those cases which I have recorded, occurred amongst the youngest and most recently vaccinated persons

subjected to the contagion of small-pox, at its five several visits in an establishment where all are nearly as one great family, is adverse to the notion that the protection conferred by vaccination diminishes with advance of years. As reasonably might it be argued from the data, whence that inference has been drawn, that the diminished, or last protection, is again required in the same individual, as that it suffers diminution; for *arithmetic* marks diminished numbers at both sides of the maximum of post-vaccine cases there recorded.

The numbers within the walls of the Foundling Hospital have varied from under 400 to 500, or even more, including the families of the teachers, and resident officers. The age of the children ranged from eight to puberty, until very lately, when several have been drafted in, not beneficially, so young as six. Formerly the infants were vaccinated before being giving out to nurse. Finding that a large number of them did not receive the cow-pock, and that the detention in the house, even for a few days, was injurious, I had them sent out as soon as possible after their reception, by which some saving of life was effected, and I recommended the governors to order a small premium to be paid the nurses for getting them vaccinated abroad. The advice was adopted, and, if carried fully into effect, tended to be as beneficial to the families of the nurses, as to the children of the Institution; but, I regret to say, it has been only in part acted on, the physician not having the power to enforce it, and the premium being very small. In November last, 105 children were drafted into the house from nurse. Of these I found forty without any mark of cow-pock or small-pox, of whom about half must have had the latter, as they have resisted its contagion since in the house, as well as vaccination. Of the rest, several were pitted by it. Adding to this fact, that not one-half of those now within the walls have vaccine marks, we thereby see at once how regardless the poor of this quarter are of the benefits of vaccination.

I was, for a short time, under the impression that I had got

possession of a fact, arising out of the vaccination of one of these forty children, which decided an interesting question concerning cow-pock. A child was brought up to the Infirmary on the fifth day of vaccination, with a papular eruption, similar to that of small-pox, three of the papulæ being in the two clusters of scars, which I had made with my lancet. This eruption went forward precisely as small-pox slightly modified, there being no difference between the sores of incision and those elsewhere. The difference between its characters and perfect variola was, that the pustules were in the early stage rather more shrunk, and that after maturation they became more elevated and globular, and recovery took place almost suddenly, when they began to discharge their contents, exactly as in the lowest degree of modification. This was unquestionably a case of modified small-pox.

Two children who escaped me, in the confusion arising out of drafting in an unusually large number, took the perfect disease afterwards. My first impression was, that it was directly produced by the vaccine virus, which I had inserted into the child's arm, from another who had a genuine vesicle, by matter procured from Dublin; but further consideration pointed out the probability that it was caused by the contagion of small-pox which had lurked in the establishment since the summer. The apparent coalition, however, between the two diseases remains still to be accounted for. In truth, the opinion that there is a remote identity in essence, between small-pox and cow-pock, is something more than conjectural. We know several diseases which destroy the susceptibility of the constitution for a recurrence of the same. We know of but the one instance in which a reciprocal agency is thus exerted between two diseases, supposed to be different. The question, then, not illogically arises, may they not be essentially the same? There is, moreover, a resemblance between the vaccine vesicle and the small-pox pustule at a certain stage. There is the indented centre, the elevated and rounded margin, the matter more or less diaphanous. The similarity of anatomical structure, supplies another

point, though a variance be found, in this respect, between perfect small-pox and some of its modified forms. Were this identity ever established, it would indicate that small-pox had its origin in some of the lower animals.

The large number of small-pox cases, which occurred in 1834, arose from its having been brought in by one of the children just drafted in, and it spread before I could protect them. Three of those whom I vaccinated at that time, had small-pox and cow-pock concurrently, without modification of the former.

How greatly it is to be lamented, that an object so important as the prevention of the ravages of small-pox, has never been effectively brought under the consideration of our legislature! There are two modes of proceeding conjointly necessary in order to be effectual; one is, the organizing vaccine institutions, and the other is, making the propagation of small-pox by inoculation penal, and making provision for insulating strolling beggars, who carry it from place to place. How culpable is the legislature which, with a single exception, has entirely neglected these matters. Last summer a beggar-woman took her place not forty yards from my door, having in her arms a child dying of the small-pox; on being threatened by the police, she removed to a less public place, but that was all. There should have been legislative provision for withdrawing this woman from public contact, and for disinfecting her before she were released. My office as Physician to the Foundling Hospital has brought before me another mode in which small-pox is propagated throughout the land. Itinerant inoculators, availing themselves of the ignorance and prejudices of their fellows, for a small fee communicated the disease from one to another. Some of their tickets have been brought me by foundling nurses, who mistook the instructions they received about vaccinating the children. One of these I recollect, ran thus, "*I scratchify that I have ejaculated,*" &c. &c. Among the children at present within the walls of the hospital, there are about a dozen, whose arms attest the fact of such *ejaculation*.

A penalty of five pounds, or imprisonment in the common jail for not less than one month, upon summary conviction before magistrates at petty sessions, would suffice to arrest the propagation of pestilence in this mode. I regret to say that the fine is needed as well as incarceration, in order to meet a *higher class* than the itinerant inoculators. The only exception which should be made in a law of this kind is, in those cases where small-pox may have actually appeared in the household previously to the inoculation.

Re-vaccination has been recommended, as a practical deduction from some of the opinions or notions which have been combated in the foregoing paper. Re-vaccination of the poor generally would be unwise, because the utmost that their improvident habits will ever submit to is, to receive vaccination once, and the effort to repeat it would only, in their minds, throw discredit on the whole matter, and thus lead to limit it in the first instance. Amongst the higher classes re-vaccination is no novelty. Good sense being the guide as to the mode, I think the repetition wise and to be commended.

The Foundling Hospital of Cork, being superseded by the general provision for the destitute, just coming into operation, I avail myself of this opportunity to state, that the gross proportional mortality for a period of fourteen years, (which ought to yield a maximum,) as returned by myself to the Sub-Commissioners of Inquiry into the state of the Irish Poor, was under forty-nine per cent. A low rate which were impossible amongst deserted children, if the reception of them had been confined to the first year of life.