

teen or twenty minutes. The pulse at this time was rapid and small, and his breathing a little embarrassed. A few minutes afterwards the muscles of the pharynx were convulsed, and death terminated his sufferings.

On dissection, no morbid appearance could be observed except unusual vascularity of the pharynx and stomach. It may be noticed that this is the only case of hydrophobia which has occurred in Edinburgh for the last thirty years.

ART. II.—*Account of a Varioloid Epidemic which occurred in George Watson's Hospital in the summer of 1835, with Remarks in illustration of the Antivariolous power of Vaccination.* By BENJAMIN J. BELL, Fellow of the Royal College of Surgeons, Edinburgh, Member of the College of Surgeons, London, late House-Surgeon to St Bartholomew's Hospital.

IT is a melancholy fact, which the experience of every day seems to confirm, that public confidence in the antivariolous efficiency of vaccination has been of late years much impaired by various untoward occurrences, the probability of which was certainly not contemplated by Jenner, and his immediate successors. These early champions of vaccination were too sanguine, it is to be feared, in their anticipations for the future; and the consequence is, that every disappointment is now viewed through a false and exaggerating medium. Hence the real and substantial benefits which this discovery has conferred upon our species, by reducing the average mortality of small-pox, are at present sadly overlooked, while an unfortunate and hurtful publicity is unavoidably given to every supposed example of vaccine imperfection.

Under these circumstances, it appears to be the duty of every one who possesses an opportunity of doing so, to assist as far as he can in removing the erroneous conceptions which are at present gaining ground. It is with this feeling that I have ventured to make public the following cases which occurred lately in George Watson's Hospital, a charitable Institution in this city for the education of boys. These cases are calculated, I think, to substantiate the true value of vaccination, and are, therefore, deserving of being made known.

I may here observe, that there were in the house at the commencement of this epidemic seventy-five boys, and that the number was kept up till the middle of July. Under ordinary circumstances, they are distributed according to their age, in four

large sleeping apartments. On the present occasion, one of these was appropriated to the reception of such as became affected with the epidemic, and in the following account the boys are distinguished into classes or sections according to the apartment to which each was attached.

On the 30th of May 1835, a child of one of the servants residing within the walls of the Hospital sickened and became very feverish; and on June 2d, a vesicular eruption began to appear, which spread eventually over all parts of the body. The vesicles were numerous, particularly on the face, and had a distinct central depression; they were surrounded by a good deal of redness; they attained a very considerable size, and speedily assumed an opaque pustular appearance. The eruption, which had every character of distinct small-pox, was followed by a very marked abatement of all the feverish symptoms, and convalescence proceeded in the most favourable manner. This child, though betwixt one and two years of age, had not been vaccinated, in consequence of some foolish objection on the part of his father.

June 4th. John Mirry, aged 10, (First Section,) one of the Hospital boys, was attacked with the ordinary symptoms of small-pox, and on the 7th, a copious eruption began to show itself on all parts of the body. The vesicles, as they enlarged had a distinct central depression, with comparatively little surrounding redness; they were semi-confluent on the face and hands, and extremely numerous over the remainder of the surface. The febrile symptoms seemed to undergo little, if any, remission when the eruption made its appearance; and he sank rapidly into a state of great prostration, which required the free use of stimulants for many days in succession. Very slender hopes were entertained of his recovery; but a decided change for the better unexpectedly took place upon the sixteenth or seventeenth day of the disease, from which period he went on improving for more than a week, when symptoms referrible to the windpipe arrested this favourable progress, and carried him off upon the 6th of July.

It would be foreign to my present purpose to enter any farther into the particulars of this case, although they might suggest one or two pathological and practical questions of considerable interest.

At the period when this boy was first taken ill, I found that he alone of all the hospital boys had never been vaccinated: all the others presented cicatrices, in some large and distinct, in others smaller and less satisfactory. Besides these, there were in the house at this time fourteen other individuals, including the Masters, the Matron, and seven female servants, the porter, his



wife, and their child, whose case has been already detailed. Of these, three had passed through the inoculated small-pox, and nine had been vaccinated; but the porter himself, as well as his child, was wholly unprotected.

No fresh cases occurred for more than three weeks, and there seemed reason to hope that the contagion had been arrested, when all at once several boys were seized with more or less constitutional disturbance.

June 28. John Blaikie, aged 14 (Third Section,) felt sick and uncomfortable, but did not make any complaint till the 1st of July, when a considerable number of vesicles were seen sprinkled over all parts of the body, especially over the face. These had a distinct central depression, with very little surrounding *areola*. They soon became pustular, and dried up in a few days, the constitutional symptoms having abated almost simultaneously with the appearance of the eruption. This boy, it will be seen, slept in a different apartment from Mirry. He was removed immediately to a separate room, to which the succeeding cases were also brought as they occurred.

June 29. John M'Lean, aged 15 (Third Section,) became sick, feverish, and oppressed. July 1. An eruption not unlike that of measles appeared in different parts of the body, but faded away almost entirely on the following day, when a few vesicles were observed here and there over the surface. These vesicles were surrounded by considerable redness, but did not attain any size, had no central depression, and speedily disappeared.

June 30. George Fairbairn, aged 12 (Second Section,) sickened, and became feverish in the same way as the others. On the 1st July, a measles-like eruption, exactly similar to that which affected M'Lean, made its appearance, with a few vesicles interspersed. The eruption became much fainter on the following day; no more vesicles could be detected, and those already visible dried up very soon and disappeared.

June 30. Andrew Betts, aged 13 (Third Section,) and James Dick, aged 9 (First Section,) became also slightly indisposed. On the 2d of July, a few vesicles, with surrounding redness, were observed on both of them. These, however, did not exhibit any central depression, and soon faded away.

July 1. William Mitchell, aged 13 (Second Section,) was very feverish, with headach, sickness, retching, and bilious vomiting. On the 2d July, a considerable number of vesicles made their appearance, particularly on the face. These became more fully developed, and subsisted longer than in some of the foregoing cases, but did not exhibit any central depression.

July 1. William Dick, aged 10 (First Section,) was sick and feverish. July 2. A few vesicles, with surrounding redness, were

observable. These did not enlarge much, but speedily disappeared.

July 1. Anthony Matheson, aged 11 (Second Section,) was seized with symptoms similar to those which occurred in the other cases. On the 2d of July, a measles-like eruption, with a few vesicles interspersed, appeared in patches over various parts of the body, 3d. The eruption was very generally diffused, and the intensity being much increased, it might be said to bear a greater resemblance to *scarlatina* than to measles, especially on the back part of the legs and thighs, where the redness was most remarkable. This eruption faded on the following day, and the vesicles did not become more numerous.

July 2. Frederick Ross, aged 10 (First Section,) became feverish, with headach, sickness, and vomiting. 3d. An eruption of *petechiæ*, almost amounting to *purpura*, made its appearance upon one arm, and the corresponding side of the chest and abdomen, with a considerable sprinkling of vesicles over all parts of the body. This boy had been long troubled with *porrigo capitis* in a subacute form.

July 2. William Armstrong, aged 9 (First Section,) became hot and feverish, and a few small vesicles were observable, with considerable surrounding redness. These were more numerous on the following day, but soon ran their course and disappeared.

July 2. Andrew Fowler, aged 10 (Second Section,) had headach, sickness, and other precursory symptoms, which continued till the 5th, when a considerable number of vesicles made their appearance in different parts of the body.

July 2. Mr H., aged 27, one of the masters of the institution, felt languid, and indisposed for any exertion. 3d. He was feverish, complained much of headach, and kept his bed. These symptoms continued without intermission till the 5th, when a considerable number of vesicles began to appear, particularly on the chin and lower part of the face. 7th. The eruption of vesicles was now much more copious over the whole surface, but especially on the face, where they afterwards coalesced. This proved to be a case of genuine small-pox, completely unmodified, to all appearance, by previous vaccination. He grew gradually worse, sunk into a state of great depression, and died on the 13th July, on the twelfth day of the disease.

July 3. Thomas Dick, aged 12 (Second Section,) became feverish, and had an eruption resembling measles on his face, hands, knees, and feet, but all other parts of the body were entirely free from it. I believe that a few vesicular spots appeared on the day following, but cannot be certain, from having neglected to make a note of his condition.



July 3. Christopher Meikle, aged 12 (Second Section,) who slept with Anthony Matheson, had the usual preliminary symptoms, and a few solitary vesicles appeared upon the surface.

July 4. David Henderson, aged 11 (First Section,) had the usual preliminary symptoms, which were relieved on the following day by a sprinkling of vesicles over the surface.

July 4. Alexander Kinnear, aged 12, (Second Section,) of great constitutional delicacy, and subject to slight *psoriasis* of the face and leg, became very hot and feverish, complaining much of headach and general uneasiness. These symptoms continued increasing until the 6th, when a few vesicles began to show themselves in different parts of the body, with much *petechial* eruption on the right side of the chest and abdomen, similar to that which was observed in Frederick Ross. 7th. The vesicles had become much more numerous, particularly on the face, where they were slightly confluent, and on the hands and feet. They exhibited the central depression, and other characteristic appearances of genuine small-pox. The constitutional symptoms were greatly relieved by the eruption, but still continued in some degree for several days. On the 14th, the pustules on the hands were still distended and white; those on the face discharging their contents, and blackening; those on other parts of the body desiccating, and peeling off. From these and other particulars, it would appear, I think, that, in the present case, the disease ran its course scarcely modified by vaccination, although a very distinct *cicatrix* remained upon the arm.

July 4. James Dun, aged 10, (First Section,) was confined to bed with the usual premonitory symptoms. 6th. Several vesicles made their appearance on various parts of the body.

July 7. William Cleland, aged 13, (Second Section,) became indisposed and feverish. 8th. A considerable number of vesicles were sprinkled over the surface, with a measles-like eruption betwixt the thighs, and at the lower part of the abdomen.

Although one or two of the boys were slightly indisposed, no additional case of vesicular eruption occurred from this date till the end of another week.

July 14. Andrew Cassels, aged 15, (Third Section,) was feverish, and complained of headach; and on the following day a few vesicles made their appearance in different parts of the body.

On this day it was arranged by the Governors that those parents who chose to do so, might remove their boys from the Hospital, as the classes could not be carried on with any advantage under present circumstances. This permission was embraced by a large majority, so that very few boys were allowed to remain. Among these no fresh cases occurred; but four

of those who left the house have since been attacked by the disease in a modified form.

William Watson, aged 14, (Third Section,) became sick and feverish within a few days after leaving the hospital. These symptoms continued for three days, when about three dozen vesicles made their appearance on different parts of the body.

Alexander Fairbairn, aged 10, (Second Section,) became indisposed at the same time with Watson, and the vesicles, which were not so numerous, showed themselves three days afterwards.

James Mirry, aged 9, (First Section,) brother of the boy who died, was attacked with the usual preliminary symptoms about eight days after leaving the hospital. The vesicles appeared on the third or fourth day, and did not exceed twelve in number.

William Allan, aged 7, (First Section,) was also attacked very mildly about the same time with the preceding boys, but his friends being at a great distance from Edinburgh, I could not obtain any additional information.

It is an interesting fact, that although the boys always sleep together two in a bed, there were only three instances in the present epidemic of bed-fellows being both attacked. These were Christopher Meikle and Anthony Matheson, John and James Mirry, George and Alexander Fairbairn. But James Mirry was not seized till six weeks after separation from his brother; and the two Fairbairns had slept in different beds for nearly three weeks before the second became ill.

There can be no doubt, I think, from the foregoing detail of cases, that the contagion of small-pox has been recently in full operation amongst the inmates of Watson's Hospital. We have, in the first place, two genuine and well-marked cases of the disease occurring almost simultaneously, and derived, in all probability, from exposure to the same infection. I have not succeeded, however, in tracing the disease to any satisfactory source; nor is there reason to believe that it was one to which these two children were more peculiarly exposed, because the first had scarcely ever been beyond the hospital gate, and the second was seldom separated from his companions. It is certainly a fact well worthy of observation, that two out of only three cases in which vaccination had been neglected, should be thus singled out from so great a number, and be attacked with small-pox within a very few days of each other. The first impression which they naturally produced was this, that previous vaccination was still exerting its influence over the constitution, and defending the rest of the boys from the variolous contagion under which these two unprotected individuals had given way. This supposition now appears to have been confirmed by subsequent occurrences, although the severe cases of Alexander Kinnear and Mr



H. may seem at first sight to weaken the evidence in its favour.

It appears from the preceding statement, that no fresh cases occurred for several weeks, when, all at once, a considerable number of boys were seized with varioloid disease. I use this appellation, because a difference of opinion is well known to exist among pathologists, with regard to the mutual relations of small-pox, chicken-pox, and those analogous cases which, occurring after vaccination, have received the name of modified small-pox. There is no doubt, I think, that many of those milder cases, which appeared in Watson's Hospital towards the end of June and beginning of July, would have been denominated by many practitioners *varicella* or chicken-pox, had they appeared by themselves at a distance from genuine small-pox; but, mingled as they were in the present epidemic with well-marked and severe cases of that disease, it is reasonable to regard them as examples of modified small-pox in individuals who had originally resisted the contagion, but who at last yielded to it when fairly developed within the walls of the institution.

Now the occurrence of these varioloid, or modified cases, instead of being calculated to weaken our confidence in the efficacy of vaccination, was absolutely necessary in the present instance for a full and satisfactory vindication of its claims. Had no other cases taken place in addition to those of the servant's child, and Mirry, the friends of cow-pox inoculation might undoubtedly have brought them forward with some feelings of triumph; but those who place less reliance in its protecting power, could scarcely have been blamed for receiving the illustration with distrust, and for regarding it as nothing more than an incidental occurrence. It might have been argued with justice, that the mere circumstance of the disease not having spread more widely is no testimony in favour of vaccination, because the same thing has taken place occasionally where vaccination could not be supposed to exercise any controlling power. In short, it is possible that solitary cases of small-pox may be met with among a number of unprotected individuals, without the disease being more widely disseminated. But this explanation will not apply to the instance before us, because these milder cases, whatever name we give them, coupled with the two severe ones, which afterwards happened simultaneously, prove beyond a doubt, that the contagion first developed in Mirry and the servant's child was still working its insidious way among those who had originally escaped.

Now it is to be observed, that these subsequent cases were not confined to any particular class or section of the boys, but occurred promiscuously among them all, showing that the whole school were equally exposed to small-pox contagion, which, though

partial in its influence, was not rendered so by separation of the sick from the healthy, or by any other precautionary measure. We may conclude, therefore, upon reasonable grounds, that small-pox has been running its course epidemically amongst the inmates of Watson's Hospital, and that all those have been attacked by it in one form or in another, who were amenable to its contagious power.

We see that out of 89 individuals who were in the house at the commencement of Mirry's illness, there have been only two affected with genuine small-pox, after vaccination, while 25 have passed through the disease in a very mild or modified form. Now, having shown that the exposure to contagion was general, we are warranted in believing that a great proportion of those who remained healthy are indebted to vaccination for their escape. This supposition appears to be confirmed by what was known of small-pox contagion in former days, previously to the discoveries of Jenner. Had the disease broken out among a large number of individuals, wholly unprotected, either by a former attack of natural small-pox, or by variolous inoculation, the probability is very great, that few, if any, would have escaped its contamination. Sydenham himself, the most observing and most accurate physician perhaps of this or of any other country, bears his valuable and decided testimony to the unsparing and inveterate nature of small-pox contagion. "*Integras familias contagio suo afflantes, nemini parcunt, cujuscunque demum ætatis is fuerit, nisi prius hoc morbo laboraverit.*" Now Watson's Hospital may be regarded as a very numerous family, where most of the members are in closest connection with each other; sleeping in the same rooms, eating at the same table, following the same occupations, and mingling in the same amusements. It is impossible surely to suppose that the statement of Sydenham would not apply with as much propriety to a large establishment like this, as to the narrower circle of an ordinary family.

It cannot be denied, that severe cases, like those of Mr H. and Kinnear, taking place subsequently to vaccination, are calculated, from their startling nature, to produce a very deep and hurtful impression. They are treasured up and remembered by ignorant or prejudiced people long after every circumstance of an encouraging nature has been forgotten. It is important, therefore, to have our ideas so arranged upon the subject, as to be capable of replying to this species of argument, in a proper and satisfactory manner.

An idea has been lately entertained, that cow-pox gradually loses its antivariolous influence over the system, after a certain period has elapsed from the date of vaccination. This question has not been sufficiently investigated, from the difficulties which



must necessarily attend the inquiry; although a few well substantiated facts seem to give some countenance to the opinion.\*

It is not necessary, however, to account in this way for those secondary cases of small-pox which we are now considering, because there is satisfactory evidence in the foregoing report, that cow-pox may exercise a very marked and salutary influence over the system at a period so remote as fifteen or sixteen years from the date of vaccination. This renders it impossible for us to assign any definite limits to the term of cow-pox efficiency, or to infer from one or two unfortunate cases like that of Mr H., that an individual betwixt the years of twenty and thirty is more likely to fall a victim to small-pox than one who is ten years younger. Although not disposed, therefore, to attach much importance to this opinion, I am very far from saying anything against the precautionary measure of a second vaccination, but would strongly recommend it in every case where any doubt is entertained as to the character of the former inoculation.

It is not uncommon, when a case of small-pox occurs after vaccination, to call in question the genuineness of the original vesicle. This is regarded by some as likely to bring discredit on the cause, and as tending to throw a degree of uncertainty over every case of vaccination; but several considerations warrant the belief, that the power of cow-pox has never yet been completely or fairly tested, in consequence of the many unfavourable causes to the operation of which it is widely exposed. It may be advisable to enter for a little upon the subject, with the view of ascertaining, if possible, the more prolific sources of failure, and thereby obviating future disappointments.

1. In estimating the effects of vaccination, we are very apt to overlook a circumstance which has done more perhaps to diminish and impair its usefulness than any other that can be mentioned. By a very large proportion of parents, the important measure in question is totally neglected, so that an extensive field is kept open at all times throughout the country for the wide-spread ravages of small-pox. It is obvious, that, even

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\* Some very interesting cases, which seem to throw light upon this question, have been published by Dr George Gregory in the London Medical Gazette of May 2, 1835. I may here allude to another opinion, brought forward in the same communication, which would appear, from a circular transmitted by the Medical Board of Calcutta in 1832 to Superintendants of vaccination, to be pretty generally entertained by the profession in India. It is conceived, that the increased number of varioloid cases occurring subsequently to vaccination may be explained upon the supposition, that vaccine lymph has gradually become deteriorated by transmission through a number of individuals. No direct or satisfactory evidence has as yet been adduced in support of this opinion; and it is certainly at variance with all our preconceptions in pathology. There are other powerful causes of vaccine inefficiency, as we shall find in the sequel, without having recourse to the foregoing explanation; but, independently of these, we are justified, I think, in partly referring the increased number of varioloid cases to the additions which are daily being made to the gross number of vaccinations.

supposing the progress of vaccination to have no other hindrance than this, we could hardly devise a more efficacious method of crippling its salutary power. Recent calculations have shown, that even under the present defective system, the average mortality by small-pox in London has been reduced three-fourths since the commencement of vaccination. How greatly might the average be still diminished, were the practice universally followed? This surely is a subject well deserving of legislative interference, when we bear in mind the high and patriotic ends to be achieved by it.

2. But in addition to this serious disadvantage, which would materially interfere with the results of vaccination under any circumstances, there are other obstructions to its progress of a still more formidable nature. It is too common, I am afraid, more especially in the humbler walks of life, for this important concern, requiring much accurate attention, and open to fallacy in many different ways, to be intrusted to the care of women and other incompetent individuals, and it can scarcely be doubted, therefore, that numerous imperfect vaccinations are every year disseminated throughout the country. The injury which this must inflict both directly and indirectly, upon the cause of cow-pox inoculation, is too obvious to require illustration. Upon the whole it would appear, that less importance is generally attached to the process of vaccination than it really deserves,—a fact strikingly exemplified in the comparative neglect which this subject usually experiences in the course of professional education; for it must be consistent with the observation of almost every one who considers the subject, that very few students have any opportunities of witnessing the progress of cow-pox, and that fewer still are disposed to embrace them. It is probable, therefore, that many spurious and imperfect inoculations are regarded as satisfactory by even authorized practitioners, fully educated and accomplished in every other branch of their profession. That this must materially impair the efficacy of cow-pox is abundantly obvious; but, were the subject brought prominently forward, and its importance impressed more deeply than it has yet been, upon the minds of students, we have every reason to anticipate that future disappointments from vaccination would become daily less numerous.

It would be foreign to the object of this paper to particularize the many sources of fallacy which attend the process of inoculation. I merely allude to them at present, with the view of calling attention to the difficulties still inseparable from the farther dissemination of genuine cow-pox, and to the cheering prospect which there is, that greater care and accuracy in time to come will add much to its future efficiency and protecting power. In the meantime, great additional security may be obtained, either



by employing at first the valuable test first recommended by Mr Bryce, or by having recourse at some future period, to a second vaccination.\*

3. The foregoing sources of cow-pox inefficiency, are sufficiently general, I think, to encourage the belief, that were they once in a great measure removed, either by legal enactment, or by the moral power of conviction on the minds of men, still nobler and more brilliant triumphs than any which have gone before are yet in reserve for the cause of vaccination. But there still remains another unfavourable circumstance, which cannot be omitted with propriety in the present argument. It is not directly injurious like the others, but has an obvious tendency to retard the progress of cow-pox, by diminishing, if not its real efficiency, the hold which it possesses in public estimation. The circumstance to which I allude is this, that most probably our expectations have been too sanguine and unlimited with regard to the universal power of vaccination in protecting every system which it has fairly entered, from the influence of variolous contagion. We have no reason to suppose, that this specific power will be exerted in every individual case where cow-pox has been employed. There is an endless variety of constitutional idiosyncrasies, and it is not uncommon to meet with individuals who appear to possess an entire immunity from certain diseases. With such persons, the local effects of vaccination may be to all appearance regular and satisfactory, while the system may still remain susceptible of small-pox whenever the contagion assails it. Reasoning analogically, there is nothing fanciful in this supposition, because it is a well established fact, that even small-pox itself is occasionally no protection from a subsequent attack of the same disease. But as such cases are rare, their occurrence was not employed in former days, as an argument against the practice of small-pox inoculation. In the same way, cases of genuine small-pox occurring subsequently to cow-pox are also comparatively rare, and cannot be adduced, therefore, with any justice whatever, against the practice of vaccination.

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\* Upon carefully re-inspecting all the cicatrices, and comparing the appearances presented by them with the preceding detail of cases, it would appear that no conjectures can be safely formed by examinations of this nature, as to the necessity or non-necessity of a second vaccination. A large proportion of the boys attacked by the late epidemic had large distinct cicatrices, while in more than half of those who escaped entirely, they were small and faint. It appears to me that much importance cannot be attached under any circumstances to the appearances of a cicatrix, when we consider how greatly these may be modified by various incidental occurrences; and without subscribing to the idea already noticed, that cow-pox gradually loses its antivariolous influence over the system during the progress of years. I would again urge the propriety of repeating the vaccination in all cases where any doubts exist as to the character of the original vesicles.