Good vaccine lymph. An inquiry as to what extent it is desirable to employ heifer vaccination, with details of that method / by John Greene.

GOOD VACCINE LYMPH.

AN INQUIRY

AS TO WHAT EXTENT IT IS DESIRABLE TO EMPLOY

HEIFER VACCINATION,

WITH DETAILS OF THAT METHOD.

BY

JOHN GREENE, L.C.P., (EDIN.),

M.R.C.S., L.S.A.

SECOND EDITION.

BIRMINGHAM:

CHARLES EDMONDS, BULL STREET.

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CONTENTS.

PREFACE.

THERE is a well-meant tendency amongst a few of my medical brethren to deprecate any very public discussion on contested points in Vaccination, fearing lest the proclamation of any divergence of opinion on minor points of the question amongst the Profession, might disturb and divide the public mind to the injury of the present very general conformity to the Vaccination Act. They contend that the public are not judges in the matter. I differ entirely from this view, and the majority of my Profession are with me in a confident belief in the value of publicity, in this, as in many other matters. The truth will always prevail when the public are consulted *en masse*, and not merely in detail. Faith in the value of vaccination, is too well founded to be so easily shaken.

In the following pages I wish to draw the attention of the public, as well as the Profession, to a weakness in our vaccination arrangements which, if allowed to continue, must ultimately lead to a very disastrous state; I mean the want of any organization for the occasional renewal of lymph from primary stocks. It is not wise to

confide a point capable of such conflicting technical debate as the one in question, entirely to scientific minds; the common sense of the nation at large, may also fitly assist in forming a judgement. On these grounds, therefore, I hope these pages will be read by others besides the Medical Profession, and so, if it be found at the end that I have aided ever so little to strengthen a public demand, that the authorities shall take the necessary steps to effect an improvement in the direction advocated, I shall be well content.

GOOD VACCINE LYMPH:

AN INQUIRY AS TO WHAT EXTENT IT IS DESIRABLE TO EMPLOY

HEIFER VACCINATION,

WITH DETAILS OF THAT METHOD.

(Carpe Diem.)

THE object of these few pages is, firstly, to show the extreme desirability of the occasional renewal of vaccine lymph from its original source; and, secondly, to give some details of the best method of doing this.

I will endeavour to accomplish the first object in the shortest possible manner, without going over, *seriatim*, the whole of the accumulated evidence, lest its very bulk should have the effect of clouding the main issue. Mr. SIMON,* in his "Papers on Vaccination" presented to Parliament, says—

> "Successive comparative experiments by Mr. BOUSQUET, Mr. ESTLIN, PROFESSOR HERING, Mr. FIARD, and Mr. STEINBRENNER, have established, I think, beyond the possibility of reasonable doubt, that certain original properties of the vaccine contagion have very generally declined, after its long successive descent from the cow."

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* Medical Officer to the Privy Council.

> "The vesicle, produced by newly humanized contagion, runs a full course; compared with which the progress of common vaccine vesicles seems unduly rapid and their termination premature. Those experiments virtually say, that millions of vaccinations have been performed with lymph not fully possessing its original endowments—perhaps more universal permanence might be given to the protective influence of infantile vaccination by well-devised arrangements for the periodical renewal of lymph."

Dr. GREGORY says—

> "I am convinced that vaccine lymph, in passing through the bodies of many persons, loses in process of time some essential portion of its activity. It follows from this that an occasional resort to primary lymph from the cow becomes a matter of great importance, perhaps even of indispensable necessity."

Now, being certain of our ground as long as we keep within the conditions under which JENNER operated, and observe well that the course of the vaccine vesicle is the same as described by him, is it not our duty, and also the safest plan, as soon as we observe a certain stock of lymph to produce continuously an effect differing in appearance and character from that of the true vaccinia of JENNER, to cease using it, especially when it is found that by reverting to the condition of early vaccination—comparative nearness to primary cow-pox—we may at once remove those differences and be again on a

sure footing? We should do this regardless of the mere theory that vaccine lymph is unaffected by time.

There is a paper of Dr. JENNER's, entitled "Instructions for Vaccine Inoculation," which appears singularly enough to have been lost sight of by writers on the subject, (at least I have never seen it referred to.) Mr. CEELY of Aylesbury, perhaps the best authority on Vaccination in the country, informs me that he did not know of its existence; it is signed "EDWARD JENNER," is printed on a loose sheet, and came into my possession amongst the medical papers of my Great-grandfather. There is found here remarkable evidence as to the comparatively hastened course of the present vaccine vesicle. Below are a few extracts therefrom :—

> "Let the vaccine fluid be taken, for the purpose of inoculation, from a pustule that is making its progress regularly, and which possesses the true vaccine character, on any day from the fifth to the eighth, or even a day or two later provided the efflorescence be not then formed around it. When the efflorescence is formed it is always most prudent to desist from taking any more of the virus from that pustule."

In other words, the efflorescence has, according to JENNER, never arrived on the eighth day and sometimes not even a day or two later. Now with average lymph in the great majority of cases on the eighth day, the

efflorescence is either completely developed or in very visible progress, and it is rare indeed for its appearance to be prolonged beyond this time.

> "A little red spot will appear on the punctured part on the third day, if the operation succeed, which on the fourth or fifth becomes perceptibly vesicated. It goes on increasing until the tenth day, when it is generally surrounded by a rose-coloured efflorescence, which remains nearly stationary for a day or two. The efflorescence then fades away, and the pustule is gradually converted into a hard glossy scab, of a dark mahogany colour. These progressive stages of the pustule are commonly completed in sixteen or seventeen days."

This accurately agrees with the observations of STEINBRENNER and others when using recent lymph and, taking the description of JENNER as the standard of true vaccinia, old stocks of lymph, not renewed for years, give rise merely to a vaccinoid disease having a comparatively hastened course, which cannot be accepted as a durable prophylactic against small-pox any more than, as JENNER pointed out, can an imperfect varioloid inoculation itself.*

> "A single pustule is sufficient to secure the constitution from the small-pox but, as we are not always certain the puncture may take effect, it will be prudent to inoculate in both arms, or to make

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* See page 51 Jenner's first "Inquiry"

> two punctures in the same arm, about an inch and a half asunder, except in very early infancy, where there is a great susceptibility of local irritation."

How is it that JENNER, with his single or double puncture, found it necessary to lay down careful instructions as to the treatment of the resulting inflammation? whilst we fearlessly employ a much greater number? Nearly two years ago, a careful and much-respected medical practitioner of this town, lately deceased, used lymph from several of my heifers. The amount of inflammation he had in his patients greatly alarmed him, till I pointed out the cause, which was using the same instrument that he employed when operating with old lymph. This instrument was a 'rake' vaccinator, effecting very large insertions, yet which evidently heretofore had not produced more effect than he desired. When this instrument was abandoned the new lymph gave him entire satisfaction; however a fact of this kind, taken alone, does not necessarily imply any superiority of prophylactic power; it simply proves that, in this particular, recent lymph agrees with that employed by JENNER.

> "The vaccine fluid is liable, from causes apparently trifling, to undergo a decomposition. In this state it sometimes produces what has been denominated the spurious pustule; that is, a pustule or an appearance on the arm not possessing the

> characteristic marks of the genuine pustule. Anomalies assuming different forms may be excited, according to the qualities of the virus applied, or to the state of the person inoculated; but by far the most frequent variety or deviation from the perfect pustule, is that which arrives at maturity, and finishes its progress much within the time limited by the true."

Here JENNER probably speaks of a well-marked case of deviation, and he points out the direction of the most frequent form, viz.:—a hastened course. JENNER in "Further Observations" p. 86, speaking of the qualities and action of variolous inoculation, which he is always particular to impress, is analogous in its phenomenon to cow-pox, says, "as well as the perfect change from that state in which variolous matter is capable of producing full and decisive effects on the constitution, to that wherein its specific properties are entirely lost, it may reasonably be supposed that it is capable of undergoing a variety of intermediate changes." and more to the same effect. Again JENNER says, in the Medical and Physical Journal, August, 1804, speaking now of cow-pox inoculation,—"The vaccine fluid, even in a pustule going through its course perfectly, if taken in its far-advanced stages, is capable of producing varieties, which will be permanent, if we continue to vaccinate from it." We do take lymph too late, bearing

in mind how prematurely forward pocks from old lymph are on the eighth day.

> "A little practice in vaccine inoculation, attentively conducted, impresses on the mind the perfect character of the vaccine pustule; therefore, when a deviation arises, of whatever kind it may be, common prudence points out the necessity of re-inoculation; first, with vaccine virus of the most active kind, and secondly, should this be ineffectual, with variolous virus. But if the constitution shews an insusceptibility of one it commonly does of the other."

This touches the main point of my argument.

Here we have distinct instructions to resort to the "most active kind of virus" as soon as any alteration is observed, the truth of the presence of which at the present day can admit "of no reasonable doubt." These instructions, it must be remembered, proceed from one who, of all men, must have had the clearest conception of where lay the strength and where the weakness of vaccination.

The point as to how we have managed so many years in this country without the protective power of vaccine lymph having suffered to a greater extent, will require explanation. From the time of JENNER occasional recourse has been had to the cow by individual effort, and the lymph more or less spread; but these partial renewals have not been so frequent of late years. Mr. CEELY,

Mr. Badcock, Mr. Estlin, Mr. Fletcher, and others, have formerly done notable service in this way. Descending to the illiterate cow-leeches it would not be difficult to find some of them who, years ago, experiencing a demand for cow-pox, and failing a spontaneous case, have successfully variolated cows on their own account and sold the lymph. The public of to-day have almost forgotten the tradition of the first source of vaccination, so that to numbers it would be a matter of new information, that it originally came from the cow.

Since the Vaccination Act of 1857, children are mostly vaccinated because they are so compelled by law. The once all-powerful dread of small-pox has been superseded by the dread of bad vaccination—a fear at any rate better founded than that of the old objectors, that they should have horns grow and brown hair. The knowledge of the educated and, perhaps, a little residuum of the old tradition amongst the poor, is sufficient to keep alive a feeling of insecurity about the lymph supply, (independently of other causes), which the assumption by the authorities of a finality in their arrangements on this head is not calculated to allay. This feeling, intensified by evil and mostly false rumours, vents itself in a vague suspicion of all vaccination, and is at the bottom of any strength which the anti-vaccinators possess—a

strength founded on the weak points of the vaccine administration forced upon us by law. The cases of *mala-praxis*, where disease has been inoculated, are so rare that, with all the aids of exaggeration, prejudice, and dubious motives, they could never be strong enough to cause a real movement in opposition to the practice of this great preventive, if only it were made scientifically true to itself and to the precepts of its great founder. My own observations on the effect of new lymph, as compared with old, show that it runs throughout a more deliberate course. The vesicles are ultimately larger for the same extent of insertion; it has a greater constitutional and local power, but not excessive; it occasionally produces the slight measly rash mentioned by Mr. ESTLIN when using recent lymph. Twice I have seen this take the form of a papular irruption, coming out about the 9th or 10th day as variola used to do in the days of inoculation—it was perfectly harmless and soon disappeared. The fall of the crusts do not take place till after the 20th day, and the resulting cicatrix is rather deeper than ordinary; 12 months after they are easily detected by the touch, in the dark. That these differences are real is apparent to the friends of patients. With respect to the comparatively tardy development of the pock, a remark is frequently made

on the 8th day, "Doctor, the child's arm has taken very poor effect to what the other children's did;" however, parental anxiety on that score is always satisfied a few days later.

A further evidence of the deterioration in lymph by long use is given by the increased and increasing success of re-vaccination in adult life. The experience of several correspondents in different parts is unanimous on this point.

Mr. SIMON in the 'Papers' above referred to, speaking of re-vaccination in the Prussian Army, says "impermanence in the effect of vaccination has increased, almost without exception, year by year, during this quarter of a century; so that the vaccinations of 1836 tested by eventual resusceptibility to cow-pox, *were not half so stable as the vaccinations of* 1813."

Mr. MARSON, writing in 1853, says—

> "The effect produced by re-vaccination sixteen or seventeen years ago was, with some few exceptions, nothing more than a little irritation, or at most an abortive vesicle with irregular areola. But, during the last three or four years, I have seen a great many persons, on whose arms the vesicles produced by re-vaccination have been quite or nearly perfect, even on those who bore good cicatrices from the first vaccination."

Mr. MARSON now informs me, that "during the present epidemic of small pox in London, my vaccina-

tion rooms have been crowded, day after day, with persons for re-vaccination, and I have performed many hundreds, scarcely ever failing to produce some effect, and in many, very many, instances the vesicles have been all but perfect, like the vesicles of a first vaccination."

I have lately supplied a large quantity of lymph to medical men for re-vaccinations, and they report that it almost always succeeds.

During the month of April, I re-vaccinated 30 adults, in 2 there was no effect; they had been vaccinated successfully seven years ago; in 3 there were only slight pimples; 25 succeeded, that is to say, an abortive vesicle of some sort was formed in the least successful cases, whilst in others the vesicle proceeded till it closely approached to the character of one produced in a primary vaccination with old lymph.

Mr. MARSON, at the small pox Hospital, has several times superseded his old lymph by new, and no doubt with his skill and opportunity of selection is enabled to keep it a long time without change; but, according to his own showing, the day will come when the results will be less satisfactory, and he will again need a new stock; but long before there is any very marked deviation it is probable that the lymph has commenced to deteriorate, or if the deviation *is* marked the opportunity of a new

stock may be wanting. All this uncertainty would be obviated if only means were provided for the regular cultivation and periodical renewal of primary stocks.

HEIFER VACCINATION.

I will now speak of the best method by which we may always have at command, an abundant source of "*the most active kind* of lymph," and I believe this will be found in the inoculation, of spontaneous or primary cow-pox, upon a succession of calves or heifers.

I first saw the detail of this system through the courtesy of Dr. BLANC who introduced it into London for a short time in 1869. It is practised on a large scale in many of the chief towns of the continent, but it is at Brussels, under the skilful and painstaking care of Dr. WARLOMONT, that I have seen its most complete development.

At the close of 1866, the Belgian Minister of the Interior, wrote to the "Royal Academy of Medicine of Belgium," reminding the Academy, that the question of the regeneration of vaccine lymph had been already examined by them, and requesting to be informed of the opinion of the Academy on the subject; whereupon a commission was appointed to report. The report of this commission was brought up the following year by Dr.

MARINUS; it concluded in the following terms:—"The commission is of advice that there is reason to reply to M. le Ministre. 1st. "That the Academy has already recognized the utility and even the necessity of regenerating or rejuvinating the vaccine, and that it has not changed opinion on this subject." 2nd. "that a really practical means of obtaining this regeneration lies, in a large application of animal vaccination founded upon the inoculation of spontaneous cow-pox upon heifers, upon which the products of this inoculation might be constantly cultivated by means recently introduced into science."

In 1868 a Royal Decree appeared, by which was founded an "Institut Vaccinal de l'Etat," with Dr. WARLOMONT as Director; the object of this was to carry out the above suggestion of the commission, to vaccinate largely from the heifer, and to distribute the lymph to all parts of the kingdom.

Commodious stables have been erected for the heifers, at the far-famed Zoological Gardens of Brussels, with waiting rooms, dressing rooms, &c., for the convenience of the public. Here the system continues to be carried on with the most complete satisfaction as to result. Dr. WARLOMONT, in 1866, was using the Beaujency stock of spontaneous cow-pox, but in 1868, was enabled to take lymph himself from a cow, attacked with the complaint at Esneau (Leige); in 1870, he again renewed the lymph

from a source discovered by Dr. PAUL, at Vanves (France). Concerning this renewal, Dr. WARLOMONT said to me, "I ought to tell you that I have sacrificed to the opinion of others, rather than to my own, in proceeding to this renewment, each time the products that I abandoned were equally good to the new. To my mind, cow-pox remains cow-pox, and guards all the qualities of spontaneous cow-pox so long as it does not leave its soil of origin, that is the heifer."

Cases of cow-pox are not so rare as has been asserted; in 1856 no less than five reports of cases were sent to the Belgian Government, by Veterinary Surgeons. I have been well informed that a whole dairy of cows, near Stroud, was affected with it last spring; this year, Mr. CALEB MORGAN, Veterinary Surgeon, of the same place, informs me of two cases. Mr. STEPHEN JENNER, of Berkeley, Gloucestershire, writes that the cow-pox is not so common as it was in his uncle's time, and that the farmers keep it a secret now, all in their power, fearing should it be known, it might injure the sale of their cheese and butter; such a difficulty would be readily overcome were a premium offered for the discovery of bona-fide cases.

All Belgian Medical Practitioners have annual right to obtain gratuitously from the "Institut Vaccinal de l'Etat," points or tubes, charged with this inoculated

primary lymph, by this means the use of matter of long descent is everywhere avoided.

It is not desired here to discuss the question as to whether it be advisable for the Government to introduce the Belgian practice of vaccination from heifer to arm into this country, or whether it would be well to do so in part; in a certain sense this has been answered in the affirmative by individual effort, and perhaps it will be well to leave it there and allow the system to find its own level; for the question, whether a certain minority, whose confidence in human vaccination has from various causes been shaken, shall be allowed the privilege of choice between the new and old method, is really of secondary importance. The main point is, that our vaccine administration shall ascertain and carry out some practical plan by which the vaccine virus employed both in public and private vaccinations, shall be uniformly active, and of tolerably recent origin; by leaving the event to the happy-go-lucky principle, it is conceivable that in some hands the vaccine vesicle would scarcely show any deviation for years, whilst in others it would rapidly do so, and that from a variety of circumstances over which there may be no control; this inequality would, to a great extent, be avoided by a yearly distribution of new virus.

As evidence that the goodness of vaccination does

vary considerably in different parts of England, may be cited the irregular result of re-vaccinations in the British army; in a series of six years, taking only those with good scars, the lowest number of successes was 311 per 1000, the highest, 393. Recruiting goes on more or less in different parts of the country much according to the state of local trade, recruits predominating sometimes from one district, sometimes from another.

In order to arrive at a better and more uniform standard of vaccination, I now suggest that the Government shall establish an Institution, or a place where cow-pox may be cultivated on the bodies of heifers, following in some respects the method now in vogue at Brussels. A suitable building might be erected in the country near a railway for the convenience of supply of animals, of which latter there is no difficulty; the expense would be small, the result could not be otherwise than good. To the Vaccinators, both public and private, it would be a most valuable and esteemed privilege, to have the opportunity once a year of renewing their vaccine from so undoubted a spring; it would enable them always to know the history of their virus from the beginning, though this may be thought, by some, to be a matter of small importance, it would to others be a source of satisfaction.

Those Medical Practitioners who, from having a small

number of vaccinations to select lymph from, require a renewal oftener than once a year, could receive human vaccine from the Authorities with the same liberality as at present.

It has been suggested that Government should seek fresh cases of cow-pox and multiply it upon children direct, without the intermediation of heifers ; but it is obvious, for several reasons, that such a course would not be so convenient or practicable. When cow-pox is first discovered, or at any rate by the time the necessary details are arranged, the pock in the cow is almost always too far advanced for the purpose, and there is then very great difficulty in getting the inoculation to take effect in the human subject; not so when inoculation is practised on another animal of the same species, a rather late stage does not then signify; it is on its own natural soil and will invariably succeed, even at a late stage, and if the vital power of the germ be already declining, it will probably be resuscitated. Mr. CEELY informs me that he presented Dr. BLANC with a crust from a case of natural cow-pox, which he had had in his possession for thirteen years, Dr. BLANC inoculated it upon one of his heifers and the result was a perfect cow-pox.*

* Does not this fact indicate to us the best means of preserving vaccine lymph? So long as the material germ is free from moisture, heat, light, and air, completely surrounded by an envelope chemically similar to itself, it seems

Again the great virulence of primary cow-pox is moderated by inoculation on young heifers and is never found afterwards to cause an excessive local action.

If the discovery of cases of cow-pox should prove difficult for any considerable time, heifers might be inoculated with variolous virus after the method of Mr. CEELY and others, an artificial cow-pox would be thus produced, the appearance and effect of which in the human constitution is not to be distinguished from that of the spontaneous kind. There is an impression that this is a difficult process to effect; that many have failed who have tried, there is no doubt, but others have succeeded

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impossible that it should ever undergo a change, whatever the length of time. And here again is an instance how often JENNER is right, and can instruct us if we will consult him; at all times he objects to lymph being preserved in the moist state,—he says, in the 'Instructions,' "various means have been suggested, but, from the test of long experience, it may be asserted that preserving it between two plates of glass is the most eligible. Let a piece of common window glass be cut into squares of about an inch each, so that they shall lie smooth when placed upon each other; let the collected vaccine fluid be confined to a small spot (about the size of a split pea) upon the centre of one of these glasses, which should be suffered to dry in the common heat of the atmosphere, without exposure to the heat of fire or the sun; when dry it should be immediately secured by placing over it the other piece of glass—nothing more is necessary for its preservation than wrapping it in a piece of clean writing paper." The present method of preserving lymph in tubes has no doubt great advantages of convenience and facility of application, but where it is desired to preserve it for any length of time—such as for transmission abroad—I should prefer it kept dry: a large drop of lymph placed in a glass cell, such as those used by microscopists, and then, when dry, covered over. Where glasses are now used it is generally the plan to superimpose the second piece whilst the lymph is yet moist, and to press it down; this spreads the lymph out in a thin layer, with small air bubbles freely interspersed—a condition decidedly favourable to decomposition. Dr. SANDERSON, in the current Medical Report to the Privy Council, gives an illustration of a group of bacteria in vaccine lymph, kept for a week with distilled water, in a capillary tube; other observers have noticed a similar condition.

at once; it is, therefore, clear that in the former case the conditions of success have been wanting, and it is most likely that these conditions could be readily ascertained. The experiments of M. CHAUVEAU at Lyons, on the inoculation of variola on cows and the subsequent vaccination of children from the variolous papules produced, show that it would be necessary to pass the contagion through more than one animal, before it would be safe to use on the human subject, as a portion of the original virus might remain unchanged beneath the skin of the animal.

The details of inoculation of primary cow-pox upon heifers are simple and easy if provided with suitable apparatus. A contract is entered into with a Farmer or Butcher for a regular supply of animals, these vary in age; on the continent they are taken as young as from 3 to 4 months, this has the advantage that they are easily managed in point of strength, but they necessitate a deal of trouble in feeding them, and are found to be very subject to attacks of diarrhœa; not being weaned, many have to undergo the worrying process of drenching, certainly not favourable to good digestion; in my first attempts at heifer inoculation, two years ago, I repeatedly failed, and I attribute this to the above difficulties of nourishing such young animals. I now prefer them from 6 to 12 months old, or even more, they are then called stirks, have been weaned a long

time, and are accustomed to fare in the open field; they eat hay, grass, or oats, with good appetite, and chew the cud happily. The younger animals are noisy and restless, and frequently require physicking with laudanum, chalk mixture, and gin balls. If the animals are chosen too soon after being weaned, they do not 'take' so well, the skin being dry, contracted, and unsuitable for the development of cow-pox. Of the breeds, the best are those of York and Gloucester, their skins are softer and more vascular, it does not signify whether males or females, but the latter by preference on the score of convenience. The young animals at Brussels are those intended for slaughter afterwards, the older ones used in Birmingham, are rearing calves, and after they have served their turn go back to their fields, having always prospered well in flesh during their confinement, which lasts a week.

The best means of securing the animal during the operation, is on a large firm table covered with a mattress and soft oil cloth, having a very strong padded iron upright at one end; the heifer is hoisted by pulleys and sling on to the table and laid on her right side, the left leg is securely fastened to the upright, and she is in other ways bound down with straps; cleanliness is provided for by a suitable arrangement in the table for the reception of discharges.

The whole of the inguinal and mammary region is then cleanly shaved, extending the surface well up the abdomen, and using soap and cold water, but not as on the continent, with a dry razor, which causes unnecessary irritation, a soft white rosy skin is thus exposed, well suited to our purpose.

A first line of very slight incisions, the fourth of an inch in length, is made posteriorly with a scalpel or other sharp instrument, and a small portion of cow-pox lymph carefully inserted in each; then a second line in such a way that the incisions shall alternate with those in the first line; they are made about an inch apart, and vary from 50 to 100 in number. The cow-pox at present used in Birmingham, is that previously referred to, viz.:—the Belgian stock, and is taken as circumstances require, either direct from the pocks of the last animal, or from capillary tubes, charged a week or so before. The places on the new heifer are now allowed sufficient time to dry, and she is removed from the table, and stabled in a kind of loose box strewed with clean straw; at Brussels, the animals are tied up, to prevent them licking the pocks, but it is better to put on them a kind of necklace, made of short pieces of wood, which will effectually prevent them reaching the mammary region, yet allow of free movement; in this way they are not fretted, and can defend themselves from flies; a

flannel bandage is safely strapped under the body for the double purpose of protecting the pocks from cold and injury. On the fourth day the heifer appears very slightly indisposed, and does not take its food quite so well; at this time a small tubercle is felt beneath the skin in the position of the incisions. On the fifth day the animal is in its usual health, and there is a marked development in the tubercles, but as yet there is no appearance of a true vesicle, notwithstanding which matter can now be taken for vaccination; the slender crust formed by the dried exudation following the original insertion of lymph is gently removed, and the base of the pock seized and compressed between a pair of forceps; the new virus speedily appears, having a light amber colour, and very speedily becomes viscid in the air.

On the sixth day there is more advance towards vesication, the pocks have the characteristic umbilicated appearance and the lymph is more abundant. On the seventh or eighth day, the vesication is complete and a light inflammatory areola is formed around each pock, but it is now too far advanced to give an invariable success in vaccination. The crusts now commence to form, and fall from the 16th to the 18th day, leaving a well marked cicatrix ; but most of the animals are sent back to the country before this stage has arrived.

The 5th and 6th days are the best for taking lymph, which may be done upon points or glasses, or in tubes; the points give the best results. They are charged on the 5th day, and re-charged on the 6th. This double charge is usually unnecessary; but it is an additional security for success when they are used by gentlemen accustomed only to the use of tubes. These points may be safely kept three weeks, though the result is scarcely so brilliant as when they are used earlier; in applying them, they should be slightly moistened with water, and well rubbed over a cluster of small scratches effected with a common sewing needle or sharp vaccinating lancet. The lymph in tubes gives a good result if used promptly. These are filled direct from the pock, the matter is then quickly blown out again upon a clean watch-glass, and an infinitesimal portion of perfectly pure glycerine is well mixed up in it by means of a glass rod; the tubes are then re-filled. This process is necessary, or otherwise the lymph would coagulate in the tubes and refuse again to leave them. It is well not to take more than two or three tubes from each pock; it is the lymph which first exudes which contains the true germinal material.

Dr. SEATON thinks that one reason of the comparative instability of heifer lymph, particularly that in tubes, is the employment of pressure necessitated by the early

stage at which it is taken, that thus a certain portion of other animal products become mixed with it; yet lymph, preserved in tubes for as long as three months, will readily 'take' on the heifer; it therefore seems necessary to seek another cause. In being transmitted to the human subject it is on foreign ground, the germs must be inserted in their freshest and most perfect vitality; should this have become lowered, they can only be resuscitated upon their own natural soil. The superior success of dry lymph over the moist mode of preservation, coupled with the fact of the greater tendency to decomposition of virus in the latter form, (see note, p. 21) points this out to be the main cause of instability, however this is easily remedied by using the lymph within a week or so of its collection ; further, as soon as the lymph becomes humanized this character is lost.

Dr. SEATON* speaks of the great uncertainty of heifer vaccination and says, "The success attendant on animal vaccination (in the now common acceptation of that term) is much greater than that which follows the use of primary cow-lymph, though short, very far short, of that which attends the ordinary practice of vaccination from arm to arm;" elsewhere, Dr. SEATON happily states that increased experience may not confirm this.

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* "Report on so called Animal Vaccination in France, Belgium, and Holland;" current Medical Officer's Report to the Privy Council.

Heifer lymph may be used with absolute certainty of success in all cases where ordinary vaccination would succeed. The method of operating is important, and it is not one requiring any special skill. It consists simply in offering a sufficiently large surface of absorption for the solid elements of the lymph by means of clusters of small scratches, and then rubbing the lymph in, not with the flat smooth blade of the wet lancet, but with a large unpolished ivory point; in this way three small places will always give excellent results. In vaccinating from the heifer to the arm direct, the grooved needle should only be employed with the first matter just flowing from the pock, as it quickly becomes too thick to run readily down the groove; six punctures may then be made, so small as to be almost invisible and so shallow as to avoid bleeding; these minute punctures will give magnificent vesicles, which on the 11th day will measure a quarter of an inch in diameter, or rather more; the resulting cicatrix, though deep, is small and symmetrical, and does not disfigure. In Belgium, the directions of the "Institut Vaccinal de l'Etat," give preference over all other modes of procedure, to the English way of operating with small scratches ; with care the success is invariable.

Too great stress has been laid upon the danger of inoculation of syphilis or other diathetic disease in arm-to-arm vaccination. This question has been fully dis-

cussed by Mr. SIMON in his last report on public vaccination: the arguments there used are convincing—that true vaccinia, properly inoculated, can never produce any other affection than itself; all that is neccessary is to take precautions against faulty proceeding; that such cases have been is unfortunately too true, but they are so extremely rare that they do not affect in the slightest degree the fact of the immense benefit of the practice of vaccination to humanity. Instances, like those lately brought forward by Mr HUTCHINSON, before the Medico-Chirurgical Society, must not be met by a stubborn and incredulous denial, but candidly examined and, if true, the avoidable cause exposed. A curious circumstance, corroborative of Mr. SIMON'S arguments, happened some years ago, in the practice of a medical gentleman, in the midland counties, well known to have studied vaccination closely; small-pox having appeared in his neighbourhood, he hastened to vaccinate several persons not already protected, on one of these he found, on the 8th day, what he considered to be a supernumerary vesicle of cow-pox. This was gratifying to him, as he thought he should be able to continue a stock of vaccine from this individual of an active kind, he therefore vaccinated several persons with this lymph. The result was very instructive, all those he vaccinated from the "supernumerary vesicles" had a mild inoculated small-pox; all

those he vaccinated from the actual pocks of his own insertion, had cow-pox and nothing more; it was evident that the contagion of small-pox had entered the system of the first patient previous to the vaccination, but that the more rapid course of the latter had caught up the small-pox and nearly obliterated it; but, still allowing one or two vesicles to appear, the result of the subsequent vaccinations proved that the two maladies had developed their separate pocks, at one and the same time in the same person, but keeping entirely distinct from each other.

The reader of these few pages will, I think, agree that the defect in our vaccinating arrangements herein treated of, is a real one, which ought to be and may be remedied; it is a defect, the evil of which will increase with the lapse of time instead of diminishing, and unless it be removed, the general protection of the community against variola will be slowly but steadily weakened.

What are we to infer from the present remarkable success in re-vaccinations, and what from the present great fatality from small-pox? The well-known fact that this disease exhibits at different times a mild and a malignant form, is not sufficient explanation, when we reflect that the epidemic, now in progress, occurs at a time when vaccination is all but universal, whilst other

recent onslaughts, known to have been of a bad form, have not really been so numerously fatal, notwithstanding that they have happened when a much larger proportion of the population have been entirely unprotected by vaccination.

This is a grave fact, that no one should try to explain away by specious theories when we have before us so plain a cause, and, to use JENNER'S words, "common prudence" points the remedy.

There is a variety of small pox which is malignant, and another which is mild, so is there an active kind of cow-pox and a feeble kind; it was the former that JENNER and his successors found to be so perfect a prophylactic. In endeavouring to establish a proof of the altered course of vaccine vesicle of long descent, I have for the most part quoted JENNER as the highest authority; but it would be easy to give extracts from other works, the language of which would still more clearly shew these distinctions. Those who wish to know what cow-pox was in 1806, let them consult the pages of WILLAN.

Let us then no longer trust to an accidental, fitful, or partial renewal of our lymph, depending so much on individual caprice.

This has indeed prevented the institution of a systematic renewal being forced upon us, long ere this,

by the otherwise inevitable advance of small-pox; but it is now seen to have failed. Such a loose mode could never bear the heavy test of universal vaccination, instituted when Parliament rightly took up the question, and passed the Act of 1857 to make vaccination compulsory, but forgot to provide means for the occasional renewal from the cow, of the matter they thus forced upon the nation. No doubt they imagined *that* portion of the subject would take care of itself, as it had hitherto done before their interference.

Let the proposed heifer Institution be so managed, that the renewal of vaccine lymph by medical men may be effected in due order and proper limit, and care be taken that it be sheltered from the pernicious effects of any popular rush.

Under such circumstances, will the cherished discovery of JENNER—the greatest gift to mankind that science has ever made—be freed from the danger that at presents threatens it, viz:—of being consigned to the number of the lost arts of past ages, and so the world be plunged once again into the fatal terrors of the most horrible of all diseases,—which GOD FORBID.