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ON THE

Practical Working

OF

DIRECT VACCINATION FROM THE CALF

BY

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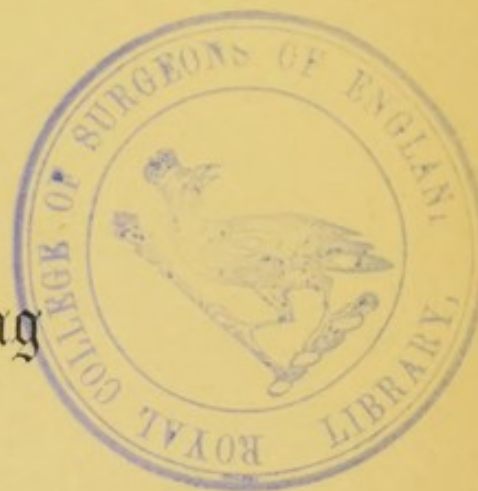
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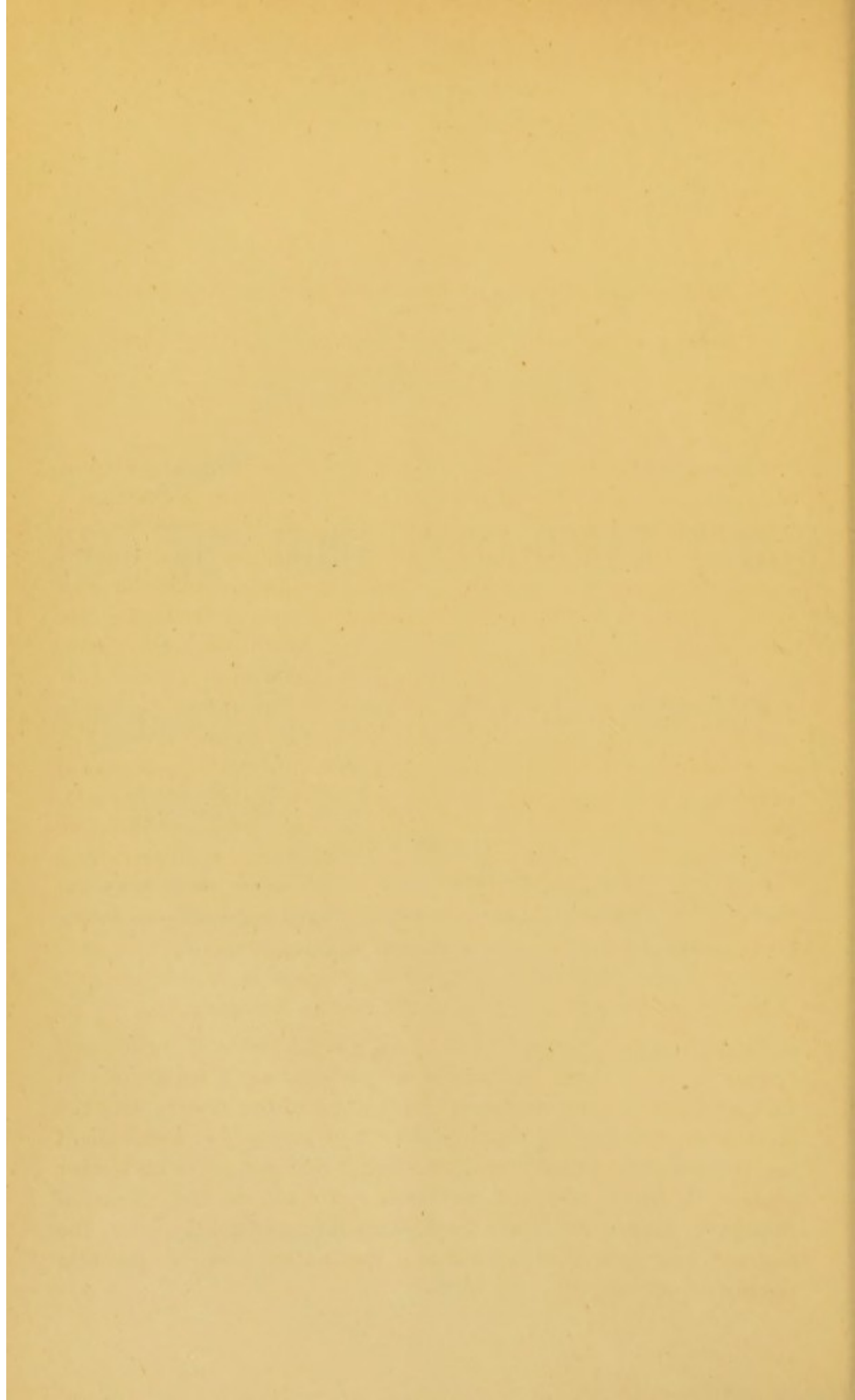
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"On the Practical Working of Direct Vaccination from the Calf."

*(A paper read before the Society of Medical Officers of Health,
January, 1882.)*

The existing epidemic of Small-pox, which has now persisted in the metropolis, with only slight fluctuations, for nearly a year and a half, must have compelled the attention of the profession to the consideration of the best means of checking its ravages, and doubtless has placed the practice of thorough primary vaccination, followed at a proper interval by re-vaccination, in advance even of complete isolation and disinfection; but after carrying out these safeguards in every practicable instance, it is probable (judging from my own experience) that some practitioners have witnessed cases of Small-pox, occurring within a comparatively short time after vaccination had apparently, from inspection of the resulting cicatrices, and sometimes indeed from the look of vesicles seen, been efficiently performed, and consequently their faith in its protective powers, and their ability to successfully answer the slanders of anti-vaccinators, may, to a certain extent, have been diminished; while, at the same time, they are possibly, in some instances, unable to speak positively as to the good or bad effects of direct vaccination from the calf, or even to teach how to do it, since no detailed directions from any one working solely with bovine lymph are yet published in England.

As, for the past twelve months, I have employed nothing but calf lymph in my practice, succeeded in propagating a supply of this vaccine from my own resources, and compared the results with the work of many friends, I take the liberty of giving you a résumé of my enquiries and observations, trusting it may not prove altogether useless to those disposed to further investigate the theme of to-night's paper, which can be divided into two parts; *first*, the position and power of animalised vaccination; *second*, the best method of working it.

[The terms humanised and animalised vaccination will explain themselves, and when I speak of direct vaccination, I mean the use of pure animal vaccine without *any* other remove.]

I have to affirm my conviction that it is no longer advisable to use humanised lymph for vaccination, and although aware that I am placing myself in opposition to the views of Jenner, Ceely, Marson, Seaton, and practically of the profession at large, I shall bring facts before you which will, I trust, cause you to support this dictum.

The use of humanised lymph should, I think, be in future discarded, for these reasons:—

- I. It is not easy to procure on an emergency.
- II. It sometimes fails to afford the desired protection.
- III. It possibly may be thought to be the means of conveying constitutional infection, and so people refuse to be vaccinated.

Conversely, calf lymph, properly cultivated, sent out, and used:—

- I. Is available on the briefest possible notice.
- II. Never fails in preventing Small-pox.
- III. Is not known to have ever produced any bad symptoms, or transmitted any disease from animal to man; persons objecting to ordinary vaccination will therefore permit themselves or children to be vaccinated from calves.

Let us examine these assertions in detail.

I. Every one of my readers, and especially the consultants, must from time to time have experienced some difficulty in procuring thoroughly reliable humanised lymph at a few hours' notice; on the contrary, any quantity that is likely to be required of absolutely fresh and perfect calf lymph can be now sent anywhere from London by next post, on receipt of letter or telegram, as was lately done at midnight, and 300 men were vaccinated by noon next day.

II. That children and adults comparatively recently vaccinated with humanised lymph, and some showing good marks, may subsequently within a few days, months, or years, contract Small-pox is an undoubted fact, probably known to all of us, and certainly demonstrated by the following tables of cases which I have witnessed.

Tables showing the number of cases of Small-pox occurring after Vaccination witnessed by the author, with the sex and age of the patients and the quality of their vaccination, with its ultimate results.

FORM A 1. FOR INFANTS AND CHILDREN UNDER 10 YEARS.

For cases in which number and not area of Cicatrices has been observed.

Cases.	Sex.	Age of Patient at time of attack of Small-pox.	Character of Small-pox.†	NUMBER AND QUALITY OF VACCINATION CICATRICES			Age at which Vaccination was performed.	Result of attack of Small-pox.	
				Place the number of the Cicatrices under one of these headings, or note the fact of absence of Scars.					
				Foveated.	Plain.	No Scar.			
One Family.	1	F.	9	Mild Discrete.	3	1	..	About 3 Months.	Recovery.
	2	M.	7	"	2	2	..	"	"
	3	F.	5	"	1	3	..	"	"
	4	M.	3	"	2	1	..	"	"
One Family.	5	F.	9	Discrete.	2	0	..	"	
	6	F.	8	"	3	0	..	"	
	7	F.	5	"	2	1	..	"	
	8	M.	3	"	1	2	..	"	
One Family.	9	M.	6	Semi-Confluent.	..	1	..	"	Death.
	10	F.	8	Discrete.	4	..	..	8 years.	Recovery.
	11	F.	6	"	4	..	..	6 years.	"
	12	F.	Infant 10 Days.	Mild Discrete.	4	..	..	1 day.	"
One Family.	13	F.	Infant.	Confluent.	..	1	..	5 months.	Death.
	14	M.	4	Discrete.	..	2	..	About 3 Months.	Recovery.
	15	M.	7	"	1	2	..	"	"
	16	F.	8	"	1	1	..	"	"
One Family.	17	F.	4	"	1	1	..	"	"
	18	F.	2	"	1	1	..	"	"
	19	M.	3	"	2	..	..	"	"
	20	M.	5	"	1	2	..	"	"
One Family.	21	F.	4	Mild Discrete.	..	2	..	"	"
	22	F.	2	"	..	2	..	"	"
	23	M.	3	Discrete.	..	3	..	..	"
	24	F.	7	Confluent.	..	..	1	7 years.	Death.
One Family.	25	M.	5	"	..	..	1	5 years.	"

* By Infancy is meant any age under six months.

† The character of an attack of Small-pox is defined as Black or Malignant Small-pox, Confluent Semi-confluent, or Discrete.

Children and Infants under ten years—3 deaths, 22 recoveries.

FORM B 1.—MALES OVER 10 YEARS.

FORM B 1.—FEMALES OVER 10 YEARS.

For cases in which number and not area of Cicatrices has been observed.

PLAIN.										FOVEATED.									
Quality of Vaccination Cicatrices.		AGE OF CASES.					Quality of Vaccination Cicatrices.		AGE OF CASES.										
		10 to 12 Years.	12 to 14 Years.	14 to 16 Years.	16 to 18 Years.	18 to 20 Years, and upwards.			10 to 12 Years.	12 to 14 Years.	14 to 16 Years.	16 to 18 Years.	18 to 20 Years.						
Recovered.	1 Cicatrix.	1	3	2	12	36	Recovered.	1 Cicatrix.	..	2	15	26							
	2 Cicatrices.	1	1	1	4	23		2 Cicatrices.	..	..	3	2					
	3 or more Cicatrices.	..	..	2	2	11		3 or more Cicatrices.	..	..	1	3			
	Died.	..	..	1	..	3		Died.	..	..	..	4		
Died.	1 Cicatrix.	..	..	1	..	..	Died.	1 Cicatrix.	..	..	..	..			
	2 Cicatrices.	..	..	..	..	2		2 Cicatrices.	..	..	1	..	
	3 or more Cicatrices.	..	..	..	..	..		3 or more Cicatrices.	..	..	..	..			
	3 or more Cicatrices.	..	..	..	..	..		3 or more Cicatrices.	..	..	..	..			
Recovered.	1 Cicatrix.	..	12	5	12	30	Recovered.	1 Cicatrix.	..	3	12	13							
	2 Cicatrices.	..	3	7	3	26		2 Cicatrices.	..	..	3	8					
	3 or more Cicatrices.	2	..	1	..	4		3 or more Cicatrices.	..	1	2	1							
	3 or more Cicatrices.	2	..	1	..	4		3 or more Cicatrices.	..	1	2	1							
Died.	1 Cicatrix.	3	..	2	1	3	Died.	1 Cicatrix.	1	2	2	4							
	2 Cicatrices.	3	1	4	2	4		2 Cicatrices.	1	2	1	3							
	3 or more Cicatrices.	1	..	1	..	4		3 or more Cicatrices.	..	..	2	1					
	3 or more Cicatrices.	1	..	1	..	4		3 or more Cicatrices.	..	..	2	1					
Said to have been Vaccinated but having no Cicatrices.	Recov.	..	..	..	..	..	Said to have been Vaccinated but having no Cicatrices.	Recov.	..	..	..	..			
	Died.	2	5	2	3	7		Died.	1	2	2	5							
Total Plain Recoveries 105						Total Foveated Recoveries 99													
Total Deaths 29						Total Deaths 25													
Total Vaccinated. 134						Total Vaccinated. 105													

As you will see, they report persons of all ages and of both sexes said to have been seen suffering from Small-pox after vaccination—469 in number—with 99 deaths, and 370 recoveries, or an average percentage of 21·108 gross.

Infants and children under 10 years old—25 in number—with 22 recoveries, and 3 deaths.

Persons of both sexes over 10 years old—444 in number—with 348 recoveries, and 96 deaths.

(Higher figures are given by Dr. Collie. Further comment is needless.)

Now, many of these sufferers showed good vaccine marks of the kind that would be deemed worthy of an extra grant from the Government Inspector (at least I used formerly to receive such grants for doing similar looking work), and yet they took Small-pox—some within six days, some within six months, and some within six years of their vaccination date. I would ask what inference can fairly be deducted from this record, except that they had been vaccinated with lymph of enfeebled protective power?

Per contra, I have successfully vaccinated with calf lymph some 150 persons of all ages primarily and secondarily in infected localities, and none of them have yet suffered from variola. Two of the patients were new-born infants, each born into a bed reeking with Small-pox; but a third baby, brought into the world in similar circumstances, which I vaccinated with humanised, for want of calf-lymph, contracted modified Small-pox, though of the mildest type.

[I have the vanity to quote myself, simply because I can give minute details and explanations; but the experience and evidence of Martin, Baker, and Rowell, in America, Warlomont, Oppendop, and Von-Pissen, on the Continent, and Ransome and Ernest Hart, in England, amply confirms my general statements.]

III. What are the facts as to the spread of constitutional infection or symptoms of local mischief following vaccination, produced by humanised and calf lymph respectively?

First, as to humanised vaccination. Reliable evidence is wanting of the possibility of the transmission of any infection but the syphilitic and scrofulous taints, by means of humanised vaccination, and the instances reported must have been due to criminal ignorance or negligence on the part of the operator.

This question was exhaustively gone into and determined by Seaton in 1868, and our advance in microscopical knowledge since then merely confirms his deductions.

Erysipelas *may*, occasionally, have followed the use of a dirty lancet, or putrescent lymph, and various skin affections (roseola, lichen, pemphigus, &c.) may sometimes be observed after an ill-fed child, scantily or unsuitably dieted, has been vaccinated; but these are faults of commission, and not fairly chargeable to vaccination.

Next as to animalised vaccination. Here, *a fortiori*, we may say for certain that no enthetic or other virus *can* be passed from beast to man by vaccination with pure animal lymph; for not only are healthy-looking beasts always selected for use, but if these are labouring under any unsuspected diathetic disease, they will develop no vesicles when vaccinated.

I give this fact, and also the truth that erysipelas has never been traced to the practice of any professional animal vaccinator, on the authority of the Professors of the Royal Veterinary College, and of numerous foreign authors.

As, in the consideration of humanised vaccination, a red spectre of possible syphilisation discloses itself to some thinkers, so to other inquirers respecting animalised lymph, sometimes appears a twin brotherhood of tuberculosis and anthrax. But the possibility of such diseases being introduced to our systems is negatived by the certainty that they take their right place in the ranks of the microbic infectious diseases, that their specific micro-organisms can readily be seen by any observer who will follow the directions of Koch, Heron, and Watson-Cheyne, and that both humanised and animalised lymph, such as any careful vaccinator would alone send out or employ, are usually free from micrococci, and never contain bacteria or bacilli. The ghosts just mentioned, are therefore, I submit to you, from henceforth finally laid.

Before taking up the second part of the paper, let me refute some of the stock objections to animalised vaccination, which, like some stock cases of food adulteration reported in analytical works from Accum's to Wynter Blyth's, have been handed down from the time of Jenner till now. These are—

I. That in practising direct animalised vaccination, whether from animal to animal or from animal to the human subject, there is considerable probability of failure, and that the operation itself is difficult of performance.

II. That papulo-vesicular eruptions (roseola, lichen) are specially induced by it, and that it is usually followed by phlegmonoid or erysipelatoid symptoms.

III. That the local, as well as constitutional, disturbance is much more severe than after humanised vaccination.

The first two objections are equally applicable to, and constantly urged against, humanised vaccination ; but they all may easily be disproved. Let us do so.

I. There is no risk of failure worth mentioning, if animalised vaccination be performed properly, whether on human beings or calves. My friend Dr. Renner's percentage success is 98·3 per cent. Dr. Warlomont states the success of the Belgian physicians to be 96 per cent. My own, in upwards of a thousand vaccinations and re-vaccinations, performed some 300 odd by myself and the rest in accordance with my written instructions, by means of lymph which I had personally propagated, collected, and sent out, is 97·13 per cent.

Dr. Renner has, since May last, vaccinated 186 calves without one failure. I, starting in March, 1881, with preserved lymph from Amsterdam and Rotterdam (this originally derived from Beaugency) and at first utterly ignorant of the practical details of the art (which I had to work out for myself), have not once been disappointed in obtaining satisfactory results from any of the 17 animals I have employed. The reasons of this unvarying success will presently be stated.

II. I have already, to some extent, pointed out the fallacy of this assertion—it is simply confounding “post” with “propter.” I must again appeal to Dr. Renner's experience as proving the correctness of mine, and challenge anyone to show me a vaccinal, papuloid, vesicular, phlegmonoid, or erysipelatoid eruption, the result of proper vaccination.

It is, of course, only fair to premise that lymph originally pure, taken at an early date, and which has since undergone no septic changes, must be alone used.

III. Neither Dr. Renner, Dr. Cory, Dr. Warlomont, nor I myself, have yet seen any of these alleged severe consequences in our practice, which altogether has not been very small.

We now come to the best method of obtaining animalised lymph from the calf, storing and transmitting it for use (A), and employing it as a protective against Small-pox (B).

(A). I may say that a knowledge of the rules for properly doing this is very rarely found in the possession of most medical men or

veterinary surgeons ; they have merely some vague ideas of inserting vaccine on the udder or vulva of a cow, at an indefinite period of its growth, and taking the result at an unknown time ; and all writers I have been able to consult seem to have been little better informed. Here is my experience.

Anxious to procure calf vaccine for myself, and objecting, for various reasons, to "mess about" the animal's udder, vulva, or scrotum, I selected in March, 1881, two calves some three weeks old, and operated on one with lymph of the Beaugency stock obtained direct from Warlomont. I shaved the hair over a place the size of a saucer behind each wither, and vaccinated by scarification, employing some ten points ; the animal subsequently wearing a cradle, being tied up and kept within sight, but not reach, of its fellow. The vaccination succeeded, the vesicles rose, and on the seventh day I proceeded to collect the lymph, which, to my chagrin, I found loaded with pus, and unfit for use.

But I also observed several vesicles on the creature's nose, exuding a clear lymph, with which I vaccinated the second calf. This animal developed vesicles, but not so numerous nor so good as the first ; and on the second day after its operation, I perceived several distinct vesicles on *its* nose likewise, which were progressing regularly, those on its withers looking like abortive humanised vesicles. The attendant then confessed that they had twice got out of their cradles and been seen licking themselves and each other ; so I had two authentic cases of auto-vaccination. I took all the lymph I could from the second beast's nose, and, with the assistance of Professor Axe, of the Royal Veterinary College, Camden Town, who most kindly inspected my animals, I devised and carried out in his presence the following plan. Another calf, six weeks old, was fastened to rings on a strong table, so as to expose its belly. This being shaved from under the loins to the umbilicus, some 50 punctures were made therein, and inoculated with my "calf-nose" lymph and some more of the Warlomont lymph. All succeeded, and showed the true cow-pox vesicle, as both Dr. Cameron, M.P. for Glasgow (one of our greatest vaccinal authorities), and the Professor, satisfied themselves, and assured me, on their subsequent examination of the creature. I then vaccinated 14 more calves in succession, without one failure, from this stock, and obtained over 2,000 points, tubes, and glasses, which were used very satisfactorily.

In June, I had the advantage of profiting by Dr. Renner's practical

knowledge, and regularly visiting his establishment up till now, I have formulated the following instructions :—

I. Calves of either sex, from three weeks old to eight weeks, can be pressed into the service; but as a rule, those of a month are best for use, as they cost less to keep, and are more remunerative when sold, though when older and eating hay, they do well for vaccinating purposes, but are somewhat expensive and unmanageable.

II. The vaccinating lymph, if not directly taken from the calf, should be lymph in squares, such as these shown. It should be as fresh as possible, and therefore by choice derived from an English source, of which I know three—Dr. Cory's, Mr. Cook's, and Dr. Renner's; though that sent out by Warlomont, Oppendop, and a Canadian vaccinator, has answered in my hands, and those of others, even up to six weeks after collection.

III. The calves should be kept in a well-drained and ventilated stable, in narrow boxes just wide enough to permit their lying down, but not turning their necks or bodies in the stall.

IV. A strong reversible table, slightly hollowed on the top, with holes to permit the escape of ordure and urine, fitted with a post, two horns and rings so as to facilitate the spread-eagling of the animal, and retaining it in a fixed position when so secured by means of a broad strap round its body, is necessary.

V. The remaining appliances, few and simple, consist of a water-bath, a drying oven, with attached centigrade thermometer, some paraffin, a few pairs of forceps, a vaccinating needle, one narrow and one broad double-edged scalpel, and ivory points, glass tubes, and squares.

VI. The calf chosen, previously found healthy, of good appetite, and normal temperature, is fastened down to the table (the lid of which is previously placed in the vertical position) by the head resting between the iron horns, the fore legs strapped together to the right-hand corner ring, and the hind legs separated and lashed respectively to the post and left-hand corner, the body strap tightened over it, and the lid then replaced horizontally. After washing with a weak carbolic acid or thymol lotion (one part in a hundred), the hair of the belly is shaved over its lower third, and the exposed skin again washed. The calf is now ready for lymph insertion, which, with preserved lymph, is best done by scarification in 50 to 80 places; but if another animal be present as a vaccinifer, an equal number of punctures with such a needle as this (needle shewn)

answers better. If lymph on points be used, you must moisten and dissolve it with a little tepid water and glycerine.

VII. Within 24 hours of vaccination each insertion is slightly reddened, and a small flattened vesicle, similar in appearance and structure to the Jennerian vesicle, but without areola, is developed and acuminates from the 3rd day to the 5th. Its shape is determined by the accident of punctures of scarification, the latter giving the finest vesicles, but being more likely to yield some with inflamed bases.

On the occurrence of this uncertain period of acumination, which can at first only be judged by a microscopic examination of the contained lymph, and subsequently by the practised tactus eruditus and observations of the examiner, there is some elevation of the vesicle, redness and hardness round its base following; it gradually dries up, its contained lymph slowly passing into pus from the seventh to the tenth day, and by one or other of these dates it drops off.

VIII. During the whole of this period of origin, maturation and desiccation of the eruption, the animal, if all is going on well, keeps remarkably free from constitutional disturbance; it has little, if any loss of appetite or increase of temperature, and no perceptible areolation or induration round the vesicles till after their acumination. Should this not be the case, I would decline using its lymph.

IX. The necessity taught by Warlomont, of always mixing two stocks of lymph, or at least working with lymph from two animals in each calf lymph vaccination, is I believe, contra-indicated, provided lymph be taken directly the vesicle acuminates.

X. As soon as acumination is observed in any vesicle, up to the 5th day inclusive (for some will show it, possibly from extra heat in some parts of the body, or increased temperature of weather, earlier than others), that vesicle should be at once opened and utilised as follows:—The animal being again placed on the table and its skin washed, the vesicle to be emptied is pinched up with forceps, some coloured exudation and serosity which exudes wiped off, and then the vesicle is removed with a broad double-edged scalpel, and drained by slight pressure on to a piece of glass; the dry scab is left alone, for fear of septism, but the pool of lymph running from it is microscoped and used as necessary for coating points and glasses and filling tubes, or for direct vaccination to child or calf.

The points are dipped in lymph and dried in the oven at a temperature of 100 C., both they and the square glasses should just previously have been kept there a few minutes.

The glasses are each coated with lymph, put together thus, have their edges plunged into paraffin melted over the water bath, and remain till it has hardened. The tubes are filled with lymph, which is defibrinated by exposure to the air and gravitation, and then are closed with paraffin, or hermetically sealed.

The preserved lymph is now ready for transmitting, and retains its properties longest when excluded from light, heat, and damp.

(B.) I hope I may be forgiven for reminding you that the high percentage of success attained by most skilled vaccinators when using animalised lymph, is due, partly to the intrinsic purity and complete preservation of the lymph itself, and also in part to the care taken by the operator. If tubes are employed, they should not be more than 24 hours old, for only defibrinated lymph will run out of tubes, and defibrinated lymph contains but few lymph corpuscles : whereas the charged points (which are artificially preserved fresh by heat) and the glasses (which are protected from changes due to air action by their warming and coat of paraffin), will sometimes keep active, as I proved last week, for six months.

But undoubtedly, the failures which happen with some people, are due chiefly to neglect, on the part of the practitioner, in properly liquefying preserved lymph : though the use of lymph taken after the 5th day, or of stuff (I will not call it matter) which is merely serosity squeezed out by too greedy collectors from the flesh surrounding the vesicle, and possibly contains minute portions of scab, integument and even muscular fibre, may be the cause of some disappointment, and perhaps of actual mischief.

I can confidently assert that if direct calf vaccination is carried out on these lines, all who so practise it will be gratified with their results, and I have now only to anticipate and answer some objections which may be made to the statements I have had the honour of submitting to you.

My contention is, that animalised vaccination is easier, safer, and more advantageous to both patient and practitioner than humanised.

Now this is in direct contradiction to most people's views, for they read that Jenner, Bryce, Di Negra, Galbiati, and Ceely, all tried vaccinating with cow-pox lymph, and did not find it answer, so had to humanise it, (*a*) to avoid failure of its action, (*b*) to escape

the effects of its violence when active, and (c) for the purpose of keeping up a regular supply. Granted! but this was because (a) they only used the natural cow-pox lymph whenever they could obtain it, not recognizing the fact that the proper period for taking lymph is just at acumination, and that the chances of resulting mischief or failure are proportionate to the lateness of collection.

(b.) The violent action attributed to natural cow lymph is, if really caused by lymph taken before or at acumination (and not by any later lymph), got over by two or three removes from heifer to heifer, just as it was obviated in Jenner's hands by two or three removes from baby to baby.

(c.) The bad roads and other difficulties of travel in the 18th century were the cause, judging from his letters to Dunning, of Jenner's not attempting any calf removes, but utilising babies instead, and the others quoted simply followed his course, and employed children alone as vaccinifers.

I consider that calves make better ones; they are cheaper, more tractable, quieter, more available when wanted, and necessarily cleaner than proletarian infants. I hardly need allude to their freedom from enthetic disease; and knowledge of this circumstance largely augments the number of persons who submit to vaccination and re-vaccination.

Lastly, I draw some attention to the fact that as Dr. Cameron demonstrated in the House of Commons last year, with an organised system of direct animalised vaccination alone, worked by the public vaccinator of each district, pure lymph might be produced daily, sufficient for the wants of every one, at a much cheaper rate of time, money, and trouble, than is now necessary for our present compulsory vaccination, and with the effect of practically abolishing Small-pox, which in London at least one is almost driven to despair of.

No longer would public vaccinators in the country be compelled by official order to postpone their vaccinations from May to October and from October to May.

No longer would stale lymph, six months old, have to be used from which to start a fresh supply at each vaccination time, with the risk of failure. No longer would town practitioners have to beg for lymph from their country brethren, and too often in vain.

Much that I have said as to the course and effects of animalised vaccination is diametrically opposed to the teaching of previous writers, especially Seaton, who has so well embodied and condensed

the experience of the profession up to this time, but if any of you will do as I did, and experiment for yourselves (a plan which our country friends can perhaps carry out most easily), you will find that my remarks are all deduced from actual observation, and you will witness the same facts that I have seen, and found since are somewhat corroborated by Martin and Warlomont, as well as by our English observers. Should any practitioner in the country or abroad be out of his usual stock of lymph, or be inclined to change it, he can easily procure enough to go on with and to propagate a fresh and lasting supply, from reliable sources in London.

I would advise him for choice, not to commence in very hot weather, nor with too young calves, and to carefully microscope the vesicles and lymph he first obtains. The photographs and microscopic slides I produce will show what these should be, their typical character can easily be learnt, and then recognised at a glance. (Photographs and slides were shown.)

I have trespassed so much on your goodness already that I will not presume to do more than to thank you for the kind attention you have paid to my ideas, and ask all of you to verify some, if not the whole of them, by giving direct animalised vaccination a trial yourselves, if not on calves, at least on babies or children of a larger growth. Fortunately, no Home Office vivisection license is necessary for legally experimenting on either animal.

NOTES BY THE AUTHOR.—OCT., 1882.

(1.) The recent occurrence of erysipelas after vaccination, at Norwich, at present deemed unaccountable, may possibly be explained by the suggestion of its being due to the employment of humanised lymph, which, like calf-lymph sometimes does, had run an irregular course of maturation, and had become septic earlier than usual; calf-lymph vaccination, carried out as above directed, would have obviated this scandal.

(2.) As his claims to originality and priority of working out and making public the details of calf-vaccination have been somewhat overlooked, the author submits that they are substantiated by the evidence offered in this pamphlet.—B.B.

