with regard to the vaccinated in the present epidemic in London, which has manifested the same malignant character as that of 1871, but which has been attended, however, with much smaller mortality, doubtless because the prior epidemic had caused so large a number of the susceptible to become secure against future infection, either in having then contracted small pox or obtained revaccination.

The gist of these observations has, you will perceive, been to induce you mainly to rely on a continuance of the system now in progress, with such improvements in administration as may be shown to be necessary, as our best security against future small-pox. The task we have before us is to build up a properly protected population. Epidemics of small-pox may be looked for, and perhaps for some time to come epidemics which may cause some considerable mortality; but severely fatal epidemics should by-and-bye be made to cease from amongst us. We are in possession of the means, if we rightly use them; not, perhaps, that we shall ever make such perfect use of them as to leave nothing to be specially done when an epidemic arises; but that special work will be brought within reasonable limits—limits such as will render its performance of easy attainment. Special provision with regard to vaccination, at times when small-pox is epidemic, is, I need not remind you, within the regulations issued under the Acts now in force.

ANIMAL VACCINATION.*

By JOHN GREENE, L.R.C.P.Ed., Friday Bridge, Birmingham.

By the courteous invitation of this the Metropolitan Counties Branch of the British Medical Association, I possess the valued privilege of expressing before you in a brief manner my opinions and views upon the subject of animal vaccination. My experience has not been very limited. I commenced the practice shortly after its introduction into this country by Dr. Blanc, and continued it more or less assiduously for eight years, during which time I either inoculated or experimented upon about four hundred animals chiefly with Belgian lymph.

I approach the matter to-night in the character of one having a profound conviction of the value to mankind of the great discovery of Jenner, and with an equally strong conviction that we have not yet reached perfection in its administrative application. I desire that a fierce light should shine on this new movement of animal vaccination that shall make manifest alike its weakness and its strength. Since the passing of the first Vaccination Act, it seems to me that the profession have ceased to exercise that high interest and activity in the matter which characterised the early years of vaccination, and have rested securely cradled in the thought of departmental infallibility; but, at the present time, a new desire has arisen, shared in by the present eminent adviser of Her Majesty's Government, to examine the subject afresh, to mark defect, and find a remedy. It may be hoped that such a spirit may lead to the capitulation of the anti-vaccinators by punishing them with a famine of reasons.

I hold the opinion that, if it can be found possible to improve a little further our present arrangements, we shall be enabled almost wholly to banish small-pox from the land. In the considerations which will here arise, the question of lymph-supply goes at once to the root.

If it be proposed by anyone that animals should be made to afford a large portion of this supply, and that a considerable percentage of the population should be protected by direct inoculation, I would immediately reply in the negative; it would be cumbersome, expensive, and, in fact, impracticable for many reasons. I feel sure this position does not require elucidating in this room; but, as used in a limited manner and for a special purpose, I desire to advocate the supply of lymph from animals. I allude to the advantages the method presents of an ever-flowing fountain of lymph of a relatively high standard of activity for the renewal of stocks at any time, when opinion or accident makes it requisite. Now, passing over for a moment certain important matters involved in this proposition, I think it possible that the detail could be so arranged that, whilst fulfilling the above splendid duty, it would at the same time discourage any wide tendency on the part of the public to have recourse to it in a too frequent or unnecessary manner, which would soon result in the destruction of the chief function warranting its existence. For instance, by limiting the production of cow-pox to one establishment for the whole kingdom, the undesirability of adopting that lymph for general vaccination would be proclaimed of itself; that a few sought and obtained vaccination in this manner would be merely a necessary incident, and careful restrictions might be trusted to prevent any excess in the number without impairing the liberty of those whose minds were set upon it, or

who entertained a fanciful or conscientious objection to hominal lymph. This is a matter of administrative detail not at present in discussion.

To proceed: the question of having occasional recourse to new stocks divides itself into two parts: 1. Whether science tells us as a fact that it is necessary for the preservation of power; 2. Whether, on any other grounds, it is expedient. To answer the first in the negative would not necessarily nullify the latter, whilst to answer it in the affirmative would involve it. To attempt to decide the leading question is to enter upon an endless struggle of argument and statistics out of which can proceed no definite issue which should stand spotless from doubt. Dogma is a poor refuge from this dilemma; the evidence thereon is, like the cow-pox itself, having an effect which is the mean between inoculability and receptivity, and so will perpetually vary with us individually.

It would be an uncongenial task for me to compile or tabulate the various facts I have read, or to quote opinions; all these are public property. I will not weary you with a twice-told tale; for the same reason, I will not again go over the ground taken by myself in the pamphlet I wrote in 1870, on *Good Vaccine Lymph*; still I must make a few remarks upon the point.

It is a fact that a number of authorities, each equally reliable, industrious, and trustworthy, have investigated the subject of lymph-degeneration, and have come to diametrically opposite conclusions. Now, many of these conclusions do not admit of an easy explanation in an adverse sense, or of a matter-of-fact explanation at all; so that we are bound to the logical inference that there are circumstances influencing the history of contagium (be it dead or living) of which we are ignorant—a truism you will say. Yes! But in argument we are apt to forget it, and build a house on sand. We have yet to learn the mysterious agency which decides the advent of an epidemic of small-pox, measles, or scarlet fever, or influences their disappearance or decline. Of the causes of their varying malignancy at different epochs, and eccentricity of incidence, we know little beyond certain subsidiary facts of local hygiene. It is not more certain that the amount of that peculiar material in the human organisation upon which variola thrives differs in individuals at all times than that it does in populations at diverse times, and, as the intensity of the effect of an inoculation of cow-pox must be the means of the exciting power of the contagium and the receptivity, it follows that, during periods when the latter is low, successive and frequent inoculations of the same lymph must result in an average reduction or degradation. Careful selection doubtless will diminish the rate of, but cannot extinguish, the process. This slow alteration may be going on in one district and not in another; or all over the kingdom imperceptibly at one time and not at another. Thus only is it possible to account for conflicting evidence where no other explanation is obvious. Thus will it seem easy to produce a vaccinoid affection bearing the same hastened relation to fresh Jennerian cow-pox as varioloid affections have to typical variola. Jenner himself has stated that a bad inoculation of variolous matter itself will not protect from variola. How much less, then, must a mere vaccinoid inoculation! In this way do I account for the large number of persons found badly protected at this late date in the history of the prophylactic.

But, if we remove the vexed question of renewal from the ground of personal conviction to that of balanced evidence, we reach the neutral zone of doubt; and here I venture to think that common sense may and will come to the rescue of perplexed science, and answer the second part of my proposition as to the expediency of renewal in the affirmative, assuming that we have the power to obtain the right article. This expediency is demonstrated by the fact that hundreds of medical men whose opinions have been formed by their own meditations and experience earnestly desire this renewal, and also thousands of the instructed part of the community at large. That there are no means available for doing so, is a plausible ground for complaint in very wide circles. It is not imperative to examine the varied reasons upon which the demand is founded; but it exists, and I affirm it can be met.

We will pass over the history of animal vaccination, from its origin in Naples and importation into France, to its development in Belgium and the United States of America. Suffice it to say that it is known that, with a sufficient capital and assiduous care, a continuous supply of animal vaccine may be afforded. It is in the character of a witness as to the qualities of this virus that I have the honour to be present to-night. In the first place, however marked are the differences between children vaccinated by the same lymph, the differences in calves are greater. Here lies the difficulty of lymph-cultivation upon the animal. It is the most care-compelling pursuit I can think of, requiring, in addition, capital and every material convenience. Looking, then, to the fact that its perfect cultivation is dependent upon human judgment and circumstance, and not upon a natural process, I cannot conceive how the assertion can be justified that cow-pox on calves, being on its own natural soil, can never change. As for the argument of "natural soil",

* Read before the Metropolitan Counties Branch.

where is this? Is it not acknowledged, in this country at least, that the juices of the cow have converted human variola into something else, different though allied. It is, then, a domesticated alien in the bovine species, and more, not less, liable to degenerate than the same taken back to man, where, though changed, it would be less alien. As a matter of fact, the same gentlemen who proclaim the "natural soil" theory are loud in praise of the calves reducing by repeated inoculation the too active qualities of original cow-pox. They suppose this process to cease at an arbitrary line. This is a dogma of a faith that shall have no martyrs: a sort of limited liability in logic. But, in saying thus much, I desire to apportion the full value to experience and judgment in cultivation. If this be united with favourable climatic and general circumstances, I can understand how years might elapse without any particular change. A case in point is the successful propagation of the Beaujeu cow-pox by Dr. H. A. Martin of Boston, United States. It appears that this stock has been passed through eight hundred and thirty-four animals, and that Dr. Martin cannot find the smallest diminution in its effective qualities. There is no occasion to mistrust the enthusiasm of Dr. Martin. It must be avowed that this gentleman has exhibited a remarkable skill in cultivation and energy in carrying out his object. In his latest "report", published this year, he writes as follows.

"During the six years and nine months since I introduced animal vaccination, I have vaccinated and superintended the vaccination of five hundred and eighty animals, besides some forty more in my earlier experiments. From these animals over eight hundred thousand charged points, and an uncounted but very large number of crusts and tubes of fluid-lymph—many thousands—have been issued. This virus has been consumed by nearly nine thousand physicians, whose names are in my register, besides a very large number whose names are not recorded. I have supplied virus to vaccinate many cities and other municipalities, great and small, to a very large number with quantities of from five hundred to eighty-four thousand points. Many of these have been supplied with aggregates of from five thousand to fifteen thousand points each. I have supplied the Departments of War and of the Interior with large quantities of virus, principally in the form of crusts, for the vaccination of troops, frontiersmen, and Indians, and, in one instance, supplied three thousand points for the arrest of a variolous epidemic which threatened the annihilation of an Icelandic colony in British America."

The figures given here constitute a big thing even for America, and it must be remembered that Dr. Martin is an Englishman born; but, unfortunately, he fails to give even an approximate estimate of the success with which this lymph has been used. Now, I will acknowledge that Dr. Martin may be cleverer than myself, but of this I am sure: that, had I sent out virus in this wholesale way, success would have been very mixed and the result pernicious. In my humble opinion, such a wide attempted application of the method of animal vaccination is an outstepping of its true function in a rash manner; one that is likely to end in mischief and mistrust of the method, perhaps involving with it the real good that is in it. Still, according to Dr. Martin's report, the conditions of success have been much improved of late, but that will not shake the opinion I have given. Be this as it may, Dr. Martin must by this time have discovered the best practical method of procedure to a greater extent, I am inclined to believe, than any one else. Therefore, I wish that Government would send out a commissioner to ascertain from Dr. Martin many points of interest; for, whatever may be the limit which ripened judgment may place upon animal vaccination, if it be ever used in this country officially and only for the purpose of renovation, skill in cultivation would be essential.*

I have argued just now that degeneration of lymph takes place alike on the calves as on man. I will go further, and state that my own observations on the animals have convinced me that such is the fact. Therefore is it that calf-vaccination is not a *ne plus ultra*, but only a link in the chain of our desires mounting to the fountain-head, that Jennerian modification of the old inoculation, the small-pox of the cow: "*variola vaccinae*". The animal is a useful intermediary by which we may multiply the primary virus *ad libitum* and deprive it of the too violent action that Estlin and others found so objectionable.

Before I consider what means we possess of having recourse to this primary virus, I will bear witness as to its qualities when transmitted through the heifer. My experience of stocks of primary lymph has been confined to those in use in Belgium. The Esneaux stock was discovered by M. Pétry in August 1868, and substituted at once for the Beaujeu virus, then actually in use on the Belgian calves. This stock I had in constant use for nearly two years in the same manner.

* Since writing the above, I have seen a series of coloured photographs of vesicles raised by Mr. Ceely from Dr. Martin's lymph. They are admirable, and will bear comparison with those obtained from the Esneaux lymph.

The animals chosen for inoculation were from four to six months old, of no particular breed, colour, or sex, but well conditioned and with clean and blooming skins. They underwent a short preparation, according the previous circumstances of each animal. A multitude of difficulties arose at first, which were never wholly removed in my case, because I did not desire that the subject should monopolise either my attention or my capital: a condition imperative to full success, whether it be intended to thrust calf-vaccination into what I would call an undue position before the public, or only to its rightful place before the profession; but these difficulties and mistakes of the early days need not recur in future, now that there is a large accumulation of experience in different countries to learn from.

The manner in which the animals are controlled for inoculation, the part in which this is done, and the method, are known. Of the subsequent treatment, little more is needed than a good clean warm stable, the same diet to which the animals have been accustomed in their preparation, that they shall be prevented from licking the part, and have the society of their fellows.

Of the effect of the Esneaux stock upon the calf, I cannot do better than show you these photographs, taken for Dr. Blanc in 1868, and kindly lent to me by Mr. Ceely. These exhibit in perfection the vesicles on the heifer. The lymph of this stock was very infective, the smallest merely accidental scratch was sure to "take"; good clear lymph was obtainable on the fifth and sixth days. The vesicles then rapidly matured, and the crusts of such as were left undisturbed fell about the twelfth day.

There is one point of discrepancy in the evidence of others and myself. It has been stated that disease does not cause any suffering or disturbance in the average state of health of the animal. Now, with the Esneaux lymph, which in every way I judge to have been a model stock, a marked alteration on the fourth day was nearly always observable: the animal ceased from food, and became dull in appearance; if it had been restless before, it was now quiet; and if it gave voice at all, it was a very low poorly sound indeed. This condition was, however, only transitory; in a few hours, all was right again.

We next have to consider the effect of this transmitted primary cow-pox upon the human subject; and it is this that I desire most to impress in view of the course of the affection which we are accustomed to see, from long humanised lymph whose pedigree has been uncrossed, or indeed, if it be possible, with lymph of the Esneaux source itself, at this date. Concerning these differences, I may mention that, when quite a young practitioner in 1859, I had scarcely a single idea of the literature of vaccination; yet, by reading a stray copy of Jenner's *Instructions*, which had descended to me, I had become dissatisfied with the lymph then in use. I ignorantly tried to improve it by vaccinating two storks with human lymph, which appropriately failed. I only mention this to show the impression made upon me by Jenner's description, and to suggest how pleased I was when I first saw the effect of the Esneaux lymph in 1869. In all my experience, I had never seen anything like it. The vesicles developed very slowly; on the eighth day, in the larger number of cases, there was not even a commencing areola; they were very firm and clean-looking, standing vigorously up from the skin. The areola came on the tenth day, sometimes on the ninth. The vesicles continued to increase until the twelfth day, sometimes attaining a development nearly equal in size to a three-penny-piece, always finer than those got from the old lymph for the same scale of insertion. The crusts were hard and black, and fell about the twentieth or twenty-second day. A common remark made by mothers on the eighth day was: "Why, doctor, this is a poor effect to what it was in the other children." This desire for brilliancy was fully gratified in a day or two. Now, this course tallies exactly with the descriptions of Jenner, Willan, and others; and I do not think it possible for any person in this country to produce, at the present time, a stock that shall equal it, on an average result, in the above particulars.

There are yet more important differences to mention: those of constitutional action. These were decidedly more marked than with the old lymph; not a single child escaped entirely; all were made manifestly poorly, restless, and feverish—sometimes so markedly that the parent has afterwards stated that she thought she would have had to send for me.

The secondary dermoid affections, of which I had had little or no experience with the old vaccinations, were now brought under my notice quite frequently: vaccine lichen coming on about the fourteenth day (I think this must be the secondary eruption delineated by Willan), a rash like measles, and also the fac-simile of one I have noticed in small-pox just before the eruptive stage.

I made acquaintance now, for the first time, with genuine eruptive supernumerary vesicles. This happened five or six times during my use of the Esneaux lymph, and on each occasion only *one*; several of

them occupied places where it was impossible they should have been accidental inoculations; once in a most unusual position, the very top of the head in a child with little hair. Since the Esneaux stock was lost, I have never seen a supernumerary vesicle, while the chances of accidental inoculation have remained the same.

A great deal has been said about the uncertainty of animal lymph. I acknowledge there is some truth in this allegation; but I never found this very troublesome. Care goes a long way to rectify it. I believe that this objection would be of no consequence with a good stock, with skill and judgment in cultivation, and with the limitations of the method I have already advocated. I found that, with the lymph from some animals and the avoidance of hurry in its transference, it was equally as certain as human lymph. That this obtains with some calves, seems to carry the inference that it is a matter of judgment in selection. Of course, in any case, I assume that only the finest vesicles are used.

In revaccination, my success was good; by counting in every mere approach to a vesicle, it exceeded the percentage obtained in Belgium, namely, 63.2; but these of mine were always done direct. Two or three times, I saw troublesome ulcerations follow on each occasion in pale-looking patients, who fainted from the operation. In all cases that succeeded, the febrile symptoms were well marked; in many, rather severely; in several, so much so as to confine them to bed, the measly rash appearing and the axillary glands being much swollen. With these few exceptions, I was quite satisfied with the use of this virus for revaccination.

Through all my experience of animal vaccination in primary cases, I have not once had cause for regret; at first, several gentlemen to whom I supplied it, and who used it with the same amount of insertion to which they had been accustomed with old lymph, were rather alarmed with its severity, and no wonder. In this connection, I should like to refer to a letter of Mr. John Pearson, Surgeon to the Lock Hospital, published in the appendix to Willan's *Vaccine Inoculation*, 1806. He says: "When the inoculator makes several parallel and transverse incisions in the same place, the inoculated part inflames violently at the period of efflorescence, and the inflammation often extends from the shoulder to the elbow. The child becomes extremely ill, large erythematous appearances take place on the arm, forearm, the neck, the side, and even on the lower extremity; a fortnight or three weeks will sometimes elapse before the child can be considered free from all danger." He further somewhat superfluously characterises this as an improper vaccination. I have seen this precisely as Mr. Pearson describes from using the new lymph like the old. What is more common now-a-days than this method of insertion which he condemns? The virus of the first human remove from the calf, singularly enough, produces more intense local effect than that from the animal, but this is lost in the subsequent removes. On one occasion, a very remarkable thing happened in the practice of a neighbouring surgeon, to whom I had supplied some of this Esneaux stock. He vaccinated a clergyman's child, six or seven months old, with lymph from the first human remove; the vacciner was healthy. I was desired to see the case on the twelfth day, and found a very much inflamed and swollen arm, with a series of from twenty to thirty full-sized vesicles exactly like small-pox, grouped irregularly upon the upper arm, lying thickest about the seat of insertion. No other vesicles appeared on any other part, and the case did well ultimately.

Of the lymph-stock of Vauves, which in 1870 superseded that of Esneaux, I have little to say. It was at first pretty much the same as the latter, but after a time it ceased to possess those active qualities that have here drawn my praise. I became dissatisfied with it; it no longer had the brilliancy and power of the Esneaux lymph, nor its infective qualities. The particular advantages to which I have referred, as manifested by the former alike on the calf as on the human subject, were categorically absent in degree. I was of opinion that it no longer accomplished the great *raison d'être* of animal vaccination—namely, the supply of a lymph of as high a standard relatively to variola as judiciousness and safety would permit. The grounds for my dissatisfaction I found to exist alike, whether I cultivated the virus from calf to calf, as I had hitherto successfully done, or inoculated the animals each time with a fresh supply from Belgium. I therefore, about fourteen months ago, discontinued to reproduce the lymph on my own calves; but I have always held that the advantage which calf-vaccination gives to overcome the strong dread in some people of the transmission of diathetic diseases by human lymph, was worthy of attention in a subsidiary or collateral way. For this reason, I still continued to procure and use Belgian lymph when it was requested, and because, although it would not bear comparison with the Esneaux virus, it did give a fair result, equalling good human stocks, minus, however, their certainty. The present lymph in use in Belgium has been derived from Milan. My knowledge of it is limited to its action

on the human subject, and from tubes alone. It would be unfair, therefore, to base any strict comparison upon this, but I am fully able to state that I am satisfied with the course and appearance of the vesicles raised from it, and with the signs of constitutional action; but, no matter how good the present stock may be, it does not affect the argument of my paper, nor is it possible that this should be neutralised by any matter-of-fact explanation.

Now, having arrived at this point, let me, in the briefest possible way, consider what is the prospect of finding a remedy for this precarious nature of the virus. I appeal to the Government to institute systematic efforts to discover fresh cases of cow-pox, and, when found, to take the lymph and experiment for themselves. Are they not morally bound to seek the truth by investigations that shall take cognisance of all well-advanced assertion; and, if it should be found that animal vaccination is either pernicious *per se*, or likely to become so by mismanagement to a greater degree than by mismanagement of merely human vaccination, which I affirm is true, then, is it not imperative that the practice of the new method in private hands should be forbidden by enactment? On the contrary, if it be found advantageous, must they not adopt it, to some extent, as one of their resources, on the same principle as that on which the Vaccination Act itself stands?

It is with very great pleasure that I hear the authorities have determined to repeat the experiments of that distinguished member of the Association, Mr. Robert Ceely, upon the artificial production of cow-pox, for it is this that should form the real basis of effort in the direction of new lymph-supply. Naturally, a fresh case of cow-pox could not always be forthcoming just when it was wanted.

I am one of the few who have been successful in producing artificial cow-pox; and, though I have tried many times, have not again succeeded. It is tempting to enter upon this question fully, but time will not allow. I hear that the first set of experiments conducted by the authorities have failed; no doubt, they will try again till they do succeed. I should look hopefully to increased experience to remove the difficulties attending this operation. Were I again engaged in this attempt, I should select new milch-cows with their first or second calf, in the very highest condition of health possible, with their skins full of the juices of the rich summer grass. I should select amongst the number several white cows and Alderneys. I would do the inoculation by deep incision with variolous lymph of not too late a stage, and from a sample mixed from several cases. I should use it with and without glycerine; the air of the stables I would have rather warm and very moist. I think premature desiccation is one of the difficulties.

In the case in which I was successful, I did not wait till the vesicle had quite formed, but took matter from the most prominent of the tubercles, passed it consecutively through two calves, and then on to two children, obtaining in one of them two magnificent cow-pox vesicles, and nothing more.

Gentlemen, we are in the presence of a crisis in the history of vaccination. Nations, dissatisfied with the spread of small-pox, yet still trusting in the kindly prophylactic, turn their eyes towards the new manner of direct inoculation. Now, more than ever, must our noble profession guide our country wisely. This favoured land, that first received the fairy gift through the wisdom of Jenner, must not lose it through the folly of his successors. We must refuse to adopt this Neapolitan practice to the extent advocated; it is cumbrous, precarious, and far more liable to mismanagement than is our present system. Let us rather take a lesson from the practical botanist, who, shaking fresh pollen into his old bloom, produces a more vigorous specimen. Let us find means, through the calf, to renew our old stocks at will from the "*variola vaccinae*". That lymph which gives the greatest constitutional affection of the right kind for the smallest number of insertions will give the greatest local beauty, and well-nigh absolute security from variola.

ERYSIPELAS AND VACCINATION.*

By SAMUEL LODGE, M.R.C.S., Bowling, Bradford.

It is with some diffidence that one approaches the subject of erysipelas here, in this hospital and in the presence of such a number of distinguished practitioners; nevertheless it may be that the disease, considered as a result of septicæmia in connection with vaccination, and treated by what I have always designated the Leeds method, could not be more appropriately discussed by any society than by the West Riding Medico-Chirurgical. Mentioning to my friend Mr. F. Hall

* Read before the West Riding Medico-Chirurgical Society.