REMARKS ON ANIMAL VACCINATION IN ITS GENERAL RELATIONS WITH VACCINATION AND REVACCINATION.

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THE Public Health Section of the meeting of the British Medical Association at Ryde, having included in its proceedings the question, "Should vaccination by calf-lymph be encouraged?" I take the opportunity of laying some remarks on the subject before the meeting. In an address which I gave at a conference of the Parliamentary Bills Committee of the British Medical Association, under the presidency of Mr. Ernest Hart, on December 4th, 1879, and which has attained great publicity, chiefly by its insertion in the *BRITISH MEDICAL JOURNAL*, I examined the principal questions relating to the subject. I may perhaps be here allowed to repeat the most essential parts of these questions.

It has been asked, If human vaccine be a protection against small-pox, why, where there is no want of it, should animal vaccine be used? My answer has been, that this substitution is necessary to satisfy certain doubts, fears, prepossessions, and, perhaps, prejudices. In countries where vaccination is legally compulsory, the duty of the State is to put into the hands of the public a vaccine lymph which shall be beyond, I will not say all adulteration, but of any suspicion of diathetic adulteration. This guarantee cannot be given with humanised vaccine, as proved by the existence of vaccinal syphilis; whilst, by the use of calf-lymph, a careful operator is always certain to offer such a guarantee to the persons inoculated by him. I also added, it is not sufficient that vaccine obtained from calves should be innocuous; it is also necessary that it should be inoculable, and that it should preserve us from variola.

As to its inoculability, is not animal vaccination the progenitor of all vaccination, past, present, and future? And, if it had not been efficacious in the hands of Jenner, how could vaccination have come into practice?

To the question whether vaccination by calf-lymph protects from small-pox like humanised vaccine, the answer was, that, up to the present time, no one had contested the point. I will therefore content myself with recalling to mind what I have formerly written on this subject: "Out of more than ten thousand children vaccinated at Brussels, with animal vaccine, from 1869 to 1870, not one case was to my knowledge noted as having been attacked by the epidemic which terrified the world in 1870 and 1871. The same immunity was shared by our revaccinated cases, which, though not nearly so numerous, were, at the same time, in the foci of the epidemic." Three years later, in 1878, I wished to unburden my mind; and at a meeting of the Académie Royale de Médecine of Belgium, on March 30th of that year, I accordingly made an appeal to my colleagues in the following terms. "I have previously said that no such case had been reported to me. I repeat it; and, up to the present time, not one of the numerous medical men whom I have interrogated on the subject has contradicted me.....Has there really not been any? that seems to me impossible.....However it may be, I appeal to hospital physicians and those gentlemen attached to charitable institutions to clear up this fact, which, in consequence of the deductions to be drawn from it, requires to be rigorously verified."

This appeal has never yet met with any response, and such a silence is the most eloquent testimony in favour of the method that I could possibly have desired. This silent eloquence is of greater value, when the ardour is considered with which the adversaries of animal vaccination, of whom a few rare specimens still exist, would have collected the failures; or if we remember, taking the larger and more general view of the immunity procured by all kinds of vaccine inoculation, that Belgium has had the honour of being the native country of the illustrious President of the International League of Antivaccinators, who no doubt would have been overwhelmed with the purest delight by such a discovery.

Finally, what is the degree of susceptibility of the human species to animal vaccine? I answer unhesitatingly, that it is equal, if not superior, to that for humanised vaccine. When the calf-lymph is inoculated direct, taken from good pustules of the proper age, no other failures

are known but those resulting from the manipulation of the operator. Out of three hundred children thus vaccinated by myself since May 1st of this year, not one puncture—and I say advisedly puncture, because with living vaccine I consider it unnecessary to use scarification—has failed to produce good pustules.

With regard to preserved vaccine, I shall content myself with reproducing the following statistics. In 1870 and 1871, thirty-three of the most reliable physicians in Belgium have reported to me the results obtained by them in vaccinations and revaccinations, by means of calf-lymph on points sent out by the State Vaccine Institute of Brussels. These results are: 1. In vaccinations, out of a total of 500 cases, there were 479 successful, being at the rate of 96 per cent. 2. In revaccinations, out of a total of 5,448 cases, there were 3,419 successes, being at the rate of 62 per cent.

These figures are very much larger than any brought out elsewhere, for, in England, the best vaccinators only reckon their successful cases at the rate of 90 per cent. after the use of humanised vaccine preserved in tubes, and at 95 per cent. when ivory points bearing the same kind of vaccine are employed.

Having refreshed the memories of my hearers with these data, which I hope they will pardon me for having again brought forward, but a nail sometimes wants a great deal of hammering before it is thoroughly driven home, I have little more to say about the absolute value of calf-lymph. When compared with humanised lymph, the equality of value can no longer be contested; and, as I have already said, it has the immense advantage of satisfying people's consciences, and of removing all fears of the communication of any disease from which the vaccinifer may be suffering, and especially of syphilis. It has at least this merit; and, were it only for this aspect of the question, it should always be accessible to the public, even where there is no failure in the supply of humanised vaccine.

How very necessary it is, then, for the strongest reasons, that the culture of animal vaccine should be encouraged, in places or under circumstances in which humanised lymph cannot be obtained in sufficient quantities to fulfil the requirements of vaccination and revaccination. And is not this what has lately been occurring in England? I would further say that this will of necessity always happen in a season of small-pox epidemic, because the public movement in favour of revaccination is then irresistible, and creates an excessive demand for lymph.

This proposition requires a few words of explanation. We know the way in which modern hygiene progresses; it does not go on in a purely scientific manner; it grows in equal proportions in the esteem and confidence of the public.

Its fundamental principle, based upon prophylaxis, is generally accepted. Everyone knows that prevention is better than cure, and everyone wishes to take care of number one. With regard to small-pox, the prophylactic power of vaccine is universally recognised; and, if it could for one moment be forgotten, do not the declamations of the antivaccinators incessantly stimulate popular conviction, through the reaction which ever follows their efforts? Everyone wishes to be protected from small-pox, and everyone knows how to do so. Hence the eagerness of all classes of the public for vaccination and revaccination, an eagerness actually fostered by the contradictions of its efficacy brought forward by the League, which only keeps the subject of vaccination before the attention of the public.

A certain restraint, however, checks this spontaneous and salutary movement; where animal vaccination is unknown, the spectre of vaccinal syphilis is present. In wishing to protect themselves from one evil, some persons fear to expose themselves to another. The possession of animal vaccine removes this restraint. We know that henceforth we may be revaccinated without having anything to fear. Hence large requirements which the production of humanised vaccine cannot meet, for the demand exceeds the supply. Confidence in calf-lymph is fully justified. In our Conference of Dec. 4th, 1879, we reduced to their true value the imputations founded of the possibility of transmitting glanders or anthrax by calf-lymph to the human species, and there is no need to traverse the ground again. Of syphilis, there is, of course, no question. There still remains tuberculosis, which, it has lately been suggested, might be communicated to a patient through animal vaccine. For this purpose, theoretical arguments, already confuted, have been relied on. It must, however, be acknowledged that these arguments have assumed an inestimably more serious phase since tuberculosis has been shown to be entitled to rank amongst the microbic infectious diseases, so that this hypothesis, which does not lack support, can at least no longer be rejected from amongst the number of possible occurrences. It is the more serious, inasmuch as cow-pox itself does not escape from this accusation, since bovine animals are subject to a disease which, though not precisely tuberculosis, is certainly akin to it.

The bovine race suffer from the pommelière, or pearl-disease, which cannot be considered as true tuberculosis. But it must be noted that the transmission of tuberculosis—excluding an immense majority of these cases which are untrustworthy—is obtained by the inoculation of the tuberculous matter itself. No one has ever, to my knowledge, anywhere spoken of transmission obtained through the serum of a tuberculous animal. We must therefore place our reliance on the inoculability of constitutional tuberculosis. Now I positively affirm that there does not exist any fact or proof whatsoever in support of a transmission of this nature.

A great movement of opinion has lately arisen in England and Germany against the use of milk obtained from cows suffering from tuberculosis or the pearl-disease. The great mortality amongst children brought up on the bottle was attributed to a great extent to the use of this milk. The accusations became more and more pressing and precise. Berlin was agitated by them, and a commission was nominated in that city to collect the statistical materials necessary for the solution of the question. The conclusions to which the commission came, formulated at the end of last year by Professor Virchow, one of its members, have been negated, in the sense that rigorous examination of the facts have not given warrant for the affirmation of transmission of bovine tuberculosis to man by milk. There only then remains pure hypothesis, which can be easily constructed in relation to every kind of medication, alimation, cohabitation—in fact of every habit.

Thus, it may be affirmed that neither syphilis, nor tuberculosis, nor glands, nor anthrax, nor any diathetic disease, can be inoculated into the human race by animal vaccine. This, however, is dependent upon one condition, which is: that the vaccine, whether living or preserved, should be taken from a healthy animal, and collected at the required moment; this is the A B C of the whole question. If preserved, it should be done according to methods which place it beyond the possibility of any subsequent change. For this purpose, I have, in a former communication (British Medical Association: Cambridge, 1880), pointed out two methods of preservation which perfectly attain this end: that of dried vaccine on ivory points, and that of liquid defibrinated vaccine introduced into tubes. I may, perhaps, be allowed to insist once more on the primary importance of efficient preservation of animal lymph.

Ivory Points.—The small pieces of ivory, on which the animal vaccine is deposited, are square at one end and pointed at the other, and the latter is the end presented to the vaccine pressed out from the pustule by the pincers, in order to charge it with lymph. The point is afterwards quickly dried in the sun, or before a fire, at a heat not above 40° (Reaumur). When the point is heavily charged, it dries in about fifteen or twenty minutes; all the serosity has evaporated, and only the dried vaccine remains, deprived of all humidity likely to macerate the active principles. Animal vaccine keeps a long time in this form. If care be exercised to preserve these points free from damp, the vaccine deposited on them escapes all decomposition, as do certain preserved vegetables from which the water has been removed in a similar way, by spreading them out on hurdles in a dry atmosphere.

To avoid the porosity of the ivory taking possession of a large amount of the matter deposited upon it, the points should be manufactured of very solid material, well polished. Under these conditions, if the first layer has been liberally applied, it is absolutely useless to cover it with a second, as was formerly the practice.

Much is said, and justly, at the present time, of American points, with ends sufficiently sharp to effect the direct introduction of the vaccine without the aid of the lancet.* These points display the perfection of workmanship; and I prefer them, on that account, to all others—notwithstanding that, for the preliminary abrading of the skin, I should always give the preference to instruments made of metal.

Glass Tubes.—When a glass tube, open at both ends, is presented to the little globule of vaccine obtained by pressure of the pustule, the liquid rises into the tube. If the vaccine remains exposed but for a few seconds in contact with the air, it is no longer the same; it becomes coagulated, calf-lymph being highly plastic. The vaccine received into the tubes does not any the more escape coagulation, so much so, that after some hours it becomes difficult to get it out, and what is then extracted is thoroughly untrustworthy in its action. These circumstances induced me to state, at the commencement of my experiments, that “tubes, if their use be persisted in, will become the grave of animal vaccination, unless means be found to prevent this coagulation of the vaccine within them”. This can now be effected by defibrinating the lymph, by a mechanical method† which removes none of the active

properties of the vaccine; and our calf-lymph, thus preserved in tubes, justly enjoys great popularity.

These methods of preservation and exportation are the only ones I can recommend; there are others, unfortunately still in use, which have given rise to serious accidents, tending to bring animal vaccination into undeserved discredit. I here specially allude to the practice of distributing pustules cut out of the animal. The little tumour is seized with a fold of skin; it is excised by dividing it with a bistoury slightly curved on the flat; it is placed between two thick glasses, one having a small concavity for its reception, and is thus sent out to greater or less distances. *A priori*, this method, no longer in use except in Italy, is already practically condemned; the occurrence at San Quireio gave it a fatal blow. Thirty-eight children, vaccinated in the height of summer by means of similar fragments of flesh, which, by the testimony of the vaccinators themselves, exhaled an abnormal odour, were seized with eclampsia and extensive phlegmonous inflammations, and many of them died. This was enough to bring the method into utter disrepute. The practice is henceforth doomed; but the method, which really consists in employing, under another form, the parenchyma of the pustule, still enjoys a certain amount of favour under the name of Milanese vaccine. Dr. Colonel Saggini thus describes, in a communication to me, dated September 10th and 19th, 1880, the manner of its preparation. “In the first place”, writes M. Saggini, “I should inform you that at Milan they always use full-grown animals, mostly cows; for the committee cannot procure calves, veal being excluded from Milanese dinner-tables. M. Nalli excises the pustules between the sixth and seventh days. He cuts through the thickness of the skin, as far as the subcutaneous cellular tissue, to give greater consistence to the fragment; then fixes it by one end with a pin on to a small piece of wood, with the bleeding surface downwards. He then scrapes the entire pustule with a knife, until he has removed all the detritus; then breaks up all the parenchyma with the same knife which he has used in scraping it, and adds some drops of glycerine. The mixture thus made is preserved in close vessels, in a refrigerator, and sold; it has the appearance of a soft brown paste.” He sends it out in goose-quills, with directions to moisten it with glycerine before use; it is sold retail, placed between two plates of glass.

I have made use of this preparation, received on different occasions from the committee at Milan, or prepared by myself according to the Milanese plan—with this improvement, that we scrape the pustule on the pincers, without excising it; and we have been able to ascertain that, on the one hand, it is efficacious, and, on the other, that it retains its activity for a long time. Whether in the calf or in the infant, the insertion of this matter, rich in animal particles, nearly always gives rise to phlegmonous and eczematous pustules. Inexperienced vaccinators think these to be “splendid pustules”; we consider them to be of bad quality, and their evolution is frequently accompanied by inflammatory complications. The pustules thus obtained in the calf are very large, with an indurated base, and richer in inflammatory serosities than in true vaccine. During six weeks we tried the experiment weekly on two calves, and the result was unvarying. The pustules always had an appearance which no consideration would induce me to produce in a child. Therefore, notwithstanding the facility of the collecting process, thoroughly economical, for it utilises the parenchyma now thought worthless, we have up to the present time firmly refused to allow its exportation by the State Vaccine Establishment, as doubtful on various accounts. At the utmost, we prepare a limited quantity, quite exceptionally, for persons who ask for it for the vaccination of calves in distant countries.

Animal vaccination cannot, with justice, be charged with the misdeeds caused by faulty methods of preserving the vaccine. Nothing is easier than to perform excellent animal vaccinations, without having recourse to the Roman pustules or the Milanese marmalade.

If, then, the public has recourse to vaccination and revaccination, it obeys a sentiment of confidence which is universally justified, and which is likely to spread in proportion as animal vaccination is more known. There is still another circumstance which will contribute to justify the demand for revaccination. The public as well as the profession now know without possibility of doubt that the immunity conferred by vaccine wears out with time, and that we must consequently resort to periodical revaccination. On this point, I have already laid down the following formula, which I now repeat. Be revaccinated,

serum. When all the serum has been thoroughly pressed out and the clot reduced to its minimum, the liquid thus obtained is introduced into its permanent depository which is quickly closed up with a preparation of paraffin or asphalt. If the vaccine be not required for immediate use, a very small quantity of distilled water is added, with about one-tenth part of glycerine, to prevent any consecutive alteration. When it is to be used very soon after it is collected, this addition may be dispensed with.

* These points are made at Boston. They may be had by writing to Dr. Martin, 27, Dudley Street, Boston, U.S.A.

† In this method, the lymph is first collected in large glass tubes, two or three millimetres in diameter. After a short interval of time, it is deposited on a capsule of glass or porcelain, where it separates itself into a clot, surrounded by

how frequent soever may have been the preceding revaccinations, whenever there is an epidemic of small-pox; and the more quickly in proportion that the epidemic is serious. This principle is destined, if it be accepted—and it certainly will be accepted by prudent persons—to increase tenfold in the course of time the demand for vaccine matter; and consequently, in a season of epidemic, the production of human vaccine will always be smaller than this demand.

This deficit will also, perhaps, arise from another idea which more and more penetrates into public opinion. A large number of persons believe that the taking of vaccine from the pustules on a child is a source of accident, and a cause of reduction of the immunity to be obtained; so that, in localities where the compliance of families in this respect is not made compulsory by law, the practitioner meets the most decided resistance to his being allowed to stock himself from the arms of the children vaccinated.

From a sentiment of reserve, which must be thoroughly comprehended, so serious is a matter which concerns nothing less than the ruin of the humanised stock, I have never brought forward this argument in support of the utility of calf-lymph, of which the possession prevents the necessity of transferring children into vaccinifers; and yet it is not clear to me that the public feeling in this instance also is not in the right. I wish to be allowed to make a simple and well-considered reflection on this point. I have already said that, out of ten thousand children I have vaccinated with animal lymph since the year 1865, not one, to my knowledge, had suffered from the terrible small-pox epidemic of 1870-1871; and I have been astonished by such an absolute immunity. This astonishment may cease to be justified if we consider that, with very rare exceptions, all the pustules of our vaccinated patients have been scrupulously respected. I will no longer dwell on this matter, not wishing to demolish the work I have laboured to build up, and which I have described in the following terms in an official report. "The Vaccine Institute, whilst being the support of vaccination in this country, should neither have the wish nor the pretension to substitute itself for the traditional practice. Arm-to-arm vaccination is, and will still long remain, powerful in its secular rights—the great power offered for the prophylaxis of small-pox; and nothing should be neglected to encourage and regulate it. Animal vaccination should be but its faithful auxiliary, but so useful an auxiliary that it would be as unjustifiable to wish to do without it as to wish to hastily renounce the older practice." Yet another word or two on this subject. When a child is brought back at the expiration of the first seven days, if it be revaccinated on the spot, even with its own vaccine lymph, it may be that there will be a fresh eruption, feeble for the most part, but occasionally showing all the signs of classic vaccinal pustule. What conclusion is to be drawn, if not that the first inoculation, insufficient to protect the subject against a second vaccinal impregnation, was *à fortiori* insufficient to guard it against variola? Hence the necessity of fresh insertions until the complete exhaustion of vaccinal receptivity. This is what I term *vaccinisation*. Thus every child brought back at the end of eight days should be revaccinated on the spot, even with its own vaccine, if it be in proper condition. If this second vaccination answer well, a third should be performed, and so on till the patient be completely *vaccinised*.

I have a decided conviction that, if this practice were followed, if all children were *vaccinised*, the immunity from small-pox would be much greater than at the present time; and it is, perhaps, from my having constantly put it into practice, that my successes have been so constant, and the result of my vaccinations so thoroughly satisfactory.

Such are the fresh considerations we have to weigh in favour of animal vaccination. It has been objected that Jenner's opinion was against it; but this argument has no weight with me. In matters of experimental science, the predictions of the greatest geniuses only show the imprudence of those who express them. Facts have decided against the predictions expressed on this subject by the immortal discoverer of vaccination.

Animal vaccine has been used in Belgium for about sixteen years. The Government has bestowed its patronage on that material since 1868, propagates it by the labours of its agents, and at the present time is engaged in studying how to still further place it free of charge in the hands of all. When the Government has achieved this result, it will examine the question of compulsory vaccination. The method of proceeding in England has not been so wise; here they have put the cart before the horse.

What can I say to those vaccinators who at the present time write to state that animal vaccination only yields failures in their hands? Nothing; or only that in other hands the amount of success, especially if my points be employed, exceeds all expectation. Mr. Edward Darke, my London agent, in a letter dated May 13th, writes to me: "One point is generally used now for one vaccination, and with ninety

per cent. of success." Is, then, an operator who always fails, with a material which is successful in such a proportion in the hands of other operators, authorised to complain of the material alone? The use of calf-lymph requires that certain rules laid down in our instructions should be followed out. It is from the want of will to carry them out that failures and deceptive results are produced. In conclusion, I desire to point out:

1. In all countries, the placing of animal vaccine in the hands of the public removes the only obstacle which still keeps recalcitrants from the lancet of the vaccinator.

2. In countries where vaccination is compulsory, it is necessary that the Administration should place within the reach of families vaccine lymph which calms their fears concerning the transmission of diathetic affections.

3. Animal vaccine is, then, the necessary succedaneum for human vaccine. To propagate it to such an extent that it shall never fail the requirements of revaccination in a season of epidemic, however extensive they may be, is the first and most imperious duty of Governments in the domain of State medicine.

REMARKS

ON THE

TREATMENT OF CARIES OF THE SPINE IN CHILDHOOD,

ESPECIALLY IN REFERENCE TO SAYRE'S PLASTER JACKET.

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Two different methods are in vogue for the treatment of caries of the spine. The one confines the patient to the horizontal posture, with the object of relieving the column of weight, and of preventing muscular action. The other consists in the use of some apparatus with which the patient is allowed to go about as usual. The most recent development of the latter method is found in Dr. Sayre's plaster-of-Paris jacket and jury-mast. As these inventions have now been before the profession for some years, the time seems to have come for looking into the whole question, and for asking what are the principles on which such an affection as caries of the spine should be treated; what are the difficulties arising out of the conditions under which these principles have to be applied in different forms of the disease; and what is the absolute, and what the relative value of the means at our disposal for carrying them into effect.

In trying to ascertain what these main principles are, we may, I think, very properly turn to the case of inflammation of the joints in childhood. The nature of the disease is very similar in the two instances; and the functions of the spine, in bearing and transmitting weight, and in taking part in the various movements of the body, closely correspond with the functions of the large joints; of which the knee may be taken as a convenient example.

It is agreed that, when the knee-joint is inflamed, it must be kept at rest; and, that rest may be secured, not only is the joint enclosed in some firm apparatus, but the patient is not allowed to bear any weight upon the limb. Either the parents are directed to have the limb maintained in the horizontal posture; or the patient is supplied with an instrument the professed purpose of which is to transmit the weight of the body to the ground, while the affected part is allowed to hang in a perfectly passive condition, with its functions as completely suspended as are those of a healthy joint during sleep. I say nothing of the efficacy of these instruments: this varies in different examples. I allude only to the fact that they are intended to place the joint at complete rest. How does the matter stand in the case of the spine? When a patient with spinal caries is supplied with a Sayre's jacket, and allowed to go about, how are the functions of the column performed? how is the weight above the seat of the disease supported, and transmitted to the pelvic arch, and how are the acts of walking, stooping, rising, lifting objects, etc., carried on? Either the patient is using his spine, or he is using his instrument instead of his spine. If he be using his spine, then the question arises, how is it that a patient may use a diseased spine, though he may not use a diseased knee-joint? while, if it be maintained that he is using his jacket instead of his spine—that the jacket becomes vicariously a part of the skeleton, and replaces the spine in