the coccus had already been five times transferred from mouse to mouse, and from the blood of the fifth mouse sown in sterilised beef-infusion. In the pus of the abscesses developed after the inoculation only the chain-forming cocci were discovered. Consequently, all the evidence necessary to prove the pus-forming property of this micro-organism had been given. It was found in the pus of a horse suffering from strangles in such numbers that it was presumed to be the cause of the suppuration; it was cultivated in purity through six generations, reinoculated in purity into a horse, and rediscovered in the abscesses formed after inoculation.

It ought to be noted that all the abscesses contained a piece of decayed tissue (sphacelus, abscess-core), and that striking numbers of the cocci were found in this piece. What had been proved by experiment in mice could also be observed in the horse, viz., that the cocci had first led to necrosis and then to suppuration at the point of inoculation.

(*To be continued.*)

THE VALUE OF INOCULATION IN PLEURO-PNEUMONIA AS DISCLOSED BY POST-MORTEM EXAMINATION OF THE VICTIMS.

By JAMES M'CALL, F.R.C.V.S.,

Principal of the Glasgow Veterinary College.

IN the month of June 1887, at the request of the Secretary to the Highland and Agricultural Society of Scotland, I gave evidence before the committee appointed by the directors of that Society "to inquire into and report as to the practicability of making an exhaustive inquiry in regard to pleuro-pneumonia." An epitome of that evidence has been published and circulated; and as its accuracy has been called in question by Mr Rutherford, Veterinary Surgeon, Edinburgh, while giving his evidence in April 1888, before the Departmental Committee of the Privy Council (before whom I had also the pleasure of giving evidence), and as the point raised, viz. *the value of inoculation as determined by post-mortem revelation*, is of paramount importance to every member of the profession, I intend in this article and its continuation in the next issue of the *Journal* to ventilate the subject, and if possible thrash it out. In answer to the question put to me by the committee in Edinburgh, "Have you had a practical experience of the results of inoculation?" I said, "Yes, in one outbreak in a dairy in Glasgow;" and at the request of the committee I sketched the history of the outbreak, which was as follows:—

History of the Salmond Outbreak.

The outbreak was amongst Mr Salmond's stock, at 207 North Woodside Road. He reported that he was suspicious of having pleuro-pneumonia in his stock. That was on 8th February, and at that time he had thirty-seven cows in his byre. On examination it was evident that one of the cows had a chest affection, and, as far as I could make out, it was pleuro-pneumonia. On killing the first cow I found both of her lungs affected. She had well-marked evidence of contagious pleuro-pneumonia. The following day we took out other two cows.

We had now good ground to go upon, and we had no hesitation in the matter; one animal's lungs were badly affected, and the other animal had been only recently attacked. I find the temperature generally ranges from 103° to 106° .

Mr Salmond, hearing so much about inoculation in Edinburgh, was anxious to have his stock inoculated, and, after interchange of letters, he was permitted to do so. I said, "You will be allowed to inoculate your animals at your own expense; but you are clearly to understand that you will not be entitled to any compensation from the local authority. If the inoculated animals show well-marked signs of pleuro-pneumonia, they will be removed to the slaughter-house, and I will remain the judge." In Glasgow I value the animals, and pass what I think are fit for human food. I said that neither I nor any one connected with the College would inoculate them, for the reason that I act for the local authority. So Mr Rutherford came through that afternoon, and the lungs of an animal that had been killed in the morning were obtained for the lymph to inoculate the other cattle.

Wishing to *experiment with the same lymph*, and for a test case, I brought from my farm a cow seven years of age, that had always been healthy, and was within six weeks of her calving. I had her brought to the College along with two yearling Ayrshires, and a yearling bull. I said to Mr Rutherford, "I want you to inoculate this cow and the two heifers, but not the bull. We will allow the bull to congregate with the two heifers. I want the brown cow inoculated, and I want to put her into Salmond's byre as soon as she has recovered from the operation." On 9th February Mr Rutherford inoculated Salmond's cows, and also the cow in calf and the two yearling heifers belonging to me. I went with him that afternoon, when he inoculated Salmond's cows, after he had inoculated the animals at the College. He first of all took the temperature of all the animals, to see whether they were in health. On completing his examination, he said there was only one above the normal. "She is $102\frac{1}{2}^{\circ}$. That is the one at the top. I think we might safely inoculate her as well as the others." I replied, "*I want you to get a fair chance*, and I think it is a pity that she should remain and be inoculated." Mrs Salmond objected to the cow going away, as she had been milking well, but I insisted that the animal should go. I said, "*Are you satisfied that you have got all the others fit subjects for inoculation?*" He said, "YES." The cow Mrs Salmond objected to being removed showed on *post-mortem* examination an old encysted portion of the left lung. I was interested in that animal. It had been bought at the Wishaw sale. The piece of lung was encapsuled, but at the same time *the capsule was broken*, and I am inclined to the opinion that this was the animal that brought the disease into the byre. I think Mr Salmond said that the animal had been in the byre about eight weeks.

Mr Rutherford inoculated all the other animals that he considered fit subjects, but *there were several cows that he did not inoculate*, as they were about to calve or had calved within eight days. When I said that I wished my brown cow inoculated, he remarked, "It is not giving her a fair chance; being so near the calving she may die." I said I would risk it. He inoculated her, and amputated her tail. The cow never showed any bad symptoms, the tail took beautifully, and the calf was born healthy and well.

On the same day Mr Salmon said, "We are badly off for milk, and I have such faith in inoculation that, if you will allow me, I will buy some cows and put them into the byre." I said, "Upon the same conditions as formerly, I will take that upon me; but you are to understand that there will be no compensation in any circumstances. Such cows, once in the byre, can only go to the slaughter-house. They cannot go to be sold in the public market, but when you are done with them they must go to the butcher." He accordingly purchased on the same date (9th February) three cows at the Wishaw sale, and on the 14th he bought five cows at the Paisley sale, intending to have them inoculated and thoroughly protected.

On 17th February, along with Mr Rutherford, I visited the byre, and found a cow showing symptoms of pleuro. I said this cow must be taken away at once. This was one of those inoculated on the 9th, and on *post-mortem* examination both lungs were found to be affected. Mr Rutherford said the inoculation had not taken. The explanation in this case was that the animal had not taken the inoculation, and that it had been affected with the disease before inoculation. Mr Rutherford saw it before being slaughtered.

On March 1st I required to take another cow and kill it, and I found both lungs bad. This animal was inoculated on the 9th. According to Mr Rutherford, it was successfully inoculated, the tail was amputated, and it was considered safe; so that if the cow of the 17th was confirmatory of the fact *that when an animal contracts pleuro-pneumonia by the natural method it cannot be inoculated*, the case of the 1st March was the very reverse. Both lungs were bad. Like the others, it had had the tail amputated, and was considered to be free from disease, and still it succumbed to pleuro-pneumonia. It was one of the animals in the byre when the disease first broke out. The tail had been amputated on the 16th, on the 28th I found the animal showing symptoms of the disease, and it was killed on 1st March.

On 3rd March I found *four cows* showing symptoms of pleuro-pneumonia. I ordered two to be removed which, according to Mr Rutherford, had been inoculated successfully, and had had their tails amputated. The *post-mortem* took place on the following day, the 4th, and the lungs of both animals were found to be bad. The carcase of one was condemned. The disease had evidently been in existence prior to inoculation. So that here again were two cows that had been inoculated, and they took, and their tails had been amputated, and yet they showed well-marked symptoms of the disease.

Again, on 7th March I ordered other two cows to be slaughtered. The *post-mortem* examination was as follows: The brown cow bad of one lung, and encystment commencing in two places. This animal had been inoculated by Mr Rutherford on 17th February and had taken. The black and white cow had one lung affected, but less so than in any animal previously slaughtered. This cow also had been inoculated on the 17th February, and had taken.

On 9th March my own brown cow, which had been brought to the College and inoculated on the 9th of February, was taken to Salmond's byre, and put amongst the others. She calved a perfectly healthy calf, and is at the present moment sound and healthy.

On 15th March, a brown cow, in good condition, was ordered to be killed. Back arched, temperature increased, symptoms of lumbago

and rheumatic arthritis, breathing disturbed, cough. I could not make out lung affection. Mrs. Salmond said, "This cow is in fair condition, and it would be a pity to let her pine away. If she has got any lung affection, you will be quite willing to compensate." I said that we would do so, and we took her away. In the *post-mortem* examination, the right lung presented three distinct encapsulated masses. This animal had been inoculated on 9th February, had taken, and was considered in health till 13th March. Two days after that she was killed. I do not think the lung had been long encapsulated; the masses were distinct from one another. *One may have a portion of encapsulated lung surrounded by healthy tissue, and, if the cow is fat, be unable to make out the condition of matters.*

On 22nd March I was requested to visit Salmond's on account of a cow exhibiting symptoms of something in her throat, but I found no obstruction. The temperature was increased, and the breathing disturbed; and as pleuro-pneumonia was in the byre, she was taken away and slaughtered. The *post-mortem* examination showed a lesion the size of two hands in the upper lobe of the right lung. The inoculation had taken, and the tail had been amputated. This cow had not been inoculated till 16th February, and had to be inoculated again along with other eleven animals.

On 21st March a brown cow, purchased at Wishaw on 9th February, exhibited symptoms of pleuro-pneumonia. This was one of the three cows bought at Wishaw for preventative inoculation. As no compensation would be given, I allowed her to wait till 4th April. I would not have allowed her to live so long, had she not been inoculated, but I did not wish it to be said that I was in too great a hurry.

April 4th.—Brown cow again carefully examined; temperature 103°; breathing catching; ordered to be slaughtered.

April 5th.—*Post-mortem* examination showed left lung upper lobes consolidated. The upper lobe of right also slightly affected. This animal had been taken into the byre on the 9th of February, the day of purchase, but she had not been inoculated by Mr Rutherford till the 16th, and had thus remained six days exposed to the contagion before the preventative remedy was applied. To make certain, she had been again inoculated on the 24th, and again on the 29th. The tail had been amputated. This animal entered the byre, apparently healthy, on 9th February, remained seven days exposed to the contagion, was inoculated on the 16th, again on the 24th, and again on the 29th February. She remained apparently healthy till the 21st March, in all two days less than six weeks. The inference is, that six weeks is the incubative stage. She had apparently taken the disease almost as soon as she entered the byre, the week's delay in inoculation allowing the animal to contract the disease by the natural method. My own cow was the only one inoculated previous to going into that byre; and as I said in my evidence before the Committee of the Highland Society, she remained healthy—a testimony as to what could be done in the case of a sound animal. *I approve of inoculation, provided it be performed on the animal before it has been exposed to the infection.*

Having now transcribed the facts and circumstances connected with the Salmond Outbreak, as they came under my observation, I shall here quote such portions of the evidence given by Mr Rutherford before the Departmental Committee as refers to the same subject.

Mr Rutherford's Evidence.

Mr JACOB WILSON.—I notice that, among other statements, you say “successful inoculation confers immunity”?—Yes. Is that your opinion?—That is my decided opinion. Is it your opinion that an animal will not accept inoculation more than once?—It is my opinion. Is that your experience?—That is my experience.

Professor BROWN.—During your experience with inoculation what results have you gained?—*I have never failed to arrest an outbreak.* There was only one outbreak in my life where *I never came to a satisfactory conclusion*, and that was where the inspector on the tenth or twelfth day after inoculation stepped in and killed the lot. *I never got a chance of coming to a conclusion about that.* But my remarks, of course, apply to the aggregate results and the individual results also of nearly 150 outbreaks. Have you known any instances of inoculated animals, that is to say, animals that you have inoculated yourself, taking the disease afterwards?—Not after I had pronounced them safe. By saying that the operation confers immunity when it is successfully performed, what do you mean exactly by the word?—I mean by the word “immunity” that it will not contract the disease, or give the disease.

That it is absolutely protected do you mean?—I think so. I have absolutely no knowledge whatever of a single instance to the contrary.

Still, you say that it is not always possible to detect when pleuro-pneumonia exists?—There are *very few cases* indeed of animals that are under the constant care and constant supervision of a veterinary surgeon where it would not be possible, very few indeed. But still there are some?—*There are some where you can make a mistake about it;* it might be something else, for instance, but there are very few, I think exceedingly few, I would not like to say how few. *They must be very few, for I cannot tax my memory that I have met with many, if any at all,* that I have never been satisfied about.

Still, it comes to this, at least, that if inoculation were adopted, as you suggested, some diseased animals would certainly be inoculated?—*Yes; but they would not remain alive afterwards.*

How do you mean?—A man who undertakes to arrest a case of pleuro-pneumonia by inoculation is not satisfied with the first inspection—he has no right to be satisfied with his first inspection—of these animals. I myself examine them individually—every animal generally auscultatively and thermometrically, and not once, but many times, until I finally dismiss them. *If my suspicions are at all aroused, that animal must go down. The result is that, in my experience, I do not know of any animals that have ever afterwards come into the hands of the slaughterers that exhibit signs of pleuro-pneumonia; that is, speaking of MY OWN PRACTICE.*

Still, there are cases, are there not, where you have not followed the animals to the slaughter-house?—Yes, there are a large number of cases, no doubt; but I have done all I could always through my clients to follow these animals up and make inquiry about them. *I never once in all my life ever had any complaint come back to me about an animal that had been under my treatment by inoculation. Never*

once has any such animal been found to be the subject of disease after being fattened, say.

Still, the records of the slaughter-houses show that a large number of inoculated animals have been found to be diseased after slaughter?—I would like to draw a distinction between inoculation speaking generally and my own practice. *I say that no animals that have been under my own immediate care have been found to have been the subject of disease after being slaughtered. I do not know of a single one.* That, of course, raises the question again of the operator.

Sir G. MACPHERSON GRANT.—In your evidence before the Highland Society you are reported to have said: “I am prepared to admit the possibility that a percentage of animals may have the disease in a limited area of the lung; such cases have come under my notice, but *it is not my experience that these animals after passing through inoculation disseminate disease.*” That is to say, that these animals were diseased without being discovered?—I am very glad that you have opened up that question—exceedingly glad, because *I think it is the one question that should be definitely settled, either by a consensus of evidence or by some demonstrations.* I must tell you that in my dealings with the disease, I occasionally in isolating outbreaks have come across cases where it was possible, or where, if there was such a thing as an animal being left with a disease of an extremely limited area, which I could not detect, that I should expect to find the disease break out amongst fresh animals placed amongst them. I can put my finger upon outbreaks of that kind, and I am very glad that you have asked Mr Biggar to come here, because his is one of those outbreaks. Mind you, there are very few, *there must be very few, because I have not met with them.* I simply admit the possibility and the probability from the appearance of the animals themselves, and from the history of the outbreak, *but I have never met with such cases. I have never met with such animals that are left and dismissed by me after inoculation communicating the disease to others.*

Mr BOWEN-JONES.—Will you please refer to page 34 of the evidence given before the Highland Society. It is not your evidence, but I have no doubt your attention has been drawn to it. On that page there is a reference to Salmond’s case? Yes; *there are lots of things there I would like to correct.*

Do you agree with Mr M’Call in this: “According to Mr Rutherford this animal was successfully inoculated, the tail was amputated, and it was considered safe”?—No.

You do not agree with Mr M’Call in that statement?—No, I do not.

Do you admit that the animal was inoculated?—Yes.

Do you admit that the animal contracted disease?—There I do not admit the correctness of Mr M’Call’s statement.

Do you know the animal I allude to?—I do not now. I will tell you why I do not know the animal. Mr Salmond is a very old gentleman, not able to manage his own business. His son manages it for him. It is not the first occasion on which I inoculated for Salmond, as Professor M’Call has stated there it is the second.

Is this statement of Professor M’Call’s correct?—“On March 1st I required to take another cow and kill it, and I found both lungs bad. This animal was inoculated on the 9th. According to Mr Rutherford, it was successfully inoculated, the tail was amputated, and it was con-

sidered safe; so that if the cow of the 17th was confirmatory of the fact, that when an animal contracts pleuro-pneumonia by the natural method it cannot be inoculated, the case of the 1st March was the very reverse. Both lungs were bad." Is that correct?—I presume it is because there were several cases.

CHAIRMAN.—Is the description of this particular case on March 1st correct?—I do not recollect the dates; but I know it was an outbreak I had a lot of bother with.

Sir G. MACPHERSON GRANT.—"This animal was inoculated on the 9th." Is that correct?—That would be correct. According to Mr Rutherford, it was successfully inoculated, the tail was amputated, and it was considered safe. Is that correct?—That is not correct.

Then you do not consider that the animal was successfully inoculated?—No; because I had already, ten days after the operation, informed the owner that several of the animals were diseased and that he should report them.

"The tail was amputated." Is that correct?—Yes. "And it was considered safe?"—No; that is not the case, because I could not say the animals were safe when at the same time I informed the owner that they had the disease.

Then you directly traverse Mr M'Call's account of that animal?—Yes.

Mr STIRLING.—But with regard to the change that you have just observed as taking place in the lung, do you mean that inoculation arrests it at that stage?—Yes, I infer so; but I tell you again I have not met with it. *In post-mortem examinations I have never been able to meet any inoculated animals with the disease.*

You have inoculated, I think, 5115 animals?—Yes.

Mr BOWEN-JONES.—We get conflicting opinions in this report of the Highland Society as to the points which you say have been definitely settled?—However, these minor points are very easily settled. *The point which to my mind must be settled by a series of experiments conducted in the face of the disease is whether, under a vigorous system of dealing with the disease, killing the diseased, killing the suspected and inoculating the remainder, it is possible for any to be left that are capable of afterwards communicating the disease, and whether they have actually communicated the disease or can do it.* That is the one point I hold that if inoculation is successfully and vigorously carried out such animals cannot exist, and if the worst came to the worst, and occasionally from a mistaken operation one or two here and there did escape and cause an outbreak somewhere else, put the same thing in operation again; inoculate, and you arrest the thing at once, but it would not occur very often, it would be exceedingly seldom. *It never occurred with me,* and I do not think it would occur so frequently as to become a question that would ever be a serious one.

CHAIRMAN.—You said, if you inoculated an animal with pleuro-pneumonia in its system, the disease would develop itself within three weeks?—Yes, it would; generally earlier.

Is it true, then, that in Mr. Salmond's outbreak in Glasgow, referred to by Mr M'Call, that, although you inoculated on February 9th, cases occurred as late as the 9th of April, two months after inoculation?—That statement does not convey to you the actual facts of the case. It is an incomplete statement; very incomplete indeed, and a very

misleading statement. There actually were *three lots of cows*. Then do you imply that the returns which are sent by the Local Authorities cannot be correct?—I have no doubt that they are correct to this extent, that that is the date on which Professor M'Call put them down, but my explanation of the case is a very different one. There were actually three lots of cows in that man's premises; that is to say, there was the lot that I inoculated; there was a lot that was left, simply because they were unfit for inoculation and were subsequently inoculated; and there was the lot that he purchased in to be inoculated immediately after the outbreak was reported.

I want to ask you whether any of the cattle inoculated on February 9th showed the disease on April 9th?—Yes, they did; but they were reported by me, not very many days after the inoculation, to the owner. I have over and over again said that it must not be held that, because cattle do not exhibit the disease at the time of inoculation and examination, they are free from it; but I say this, that before a given time they will exhibit it. These animals did exhibit it, and they were pointed out by me to the owner for him to do his part; that is to say, bring them to Mr M'Call's notice. He never did so, and I do not think Mr M'Call was attending the byres as closely as I was; I was in the byres every other day almost.

Mr BOWEN-JONES.—Do you know of any cases where inoculation has taken successfully more than once on the same animal?—No, I say it is impossible.—Is inoculation always effectual?—Yes; inoculation will undoubtedly always arrest and stamp out pleuro-pneumonia.

In the next number of this *Journal* I shall refer in the first place to the objections which Mr Rutherford has taken to my evidence, and in the second place I shall give in detail the history of a recent outbreak of pleuro-pneumonia on the same premises, and I shall by *post-mortem* and other evidence prove that Mr Rutherford's inoculation of Salmond's stock in February 1887 not only did not arrest the spread of the disease at that time, but that it actually carried it on, and was the cause of a second outbreak in June of the present year.

FARCY OF THE OX.¹

By M. E. NOCARD, Director of the Alfort Veterinary School.

THE older authors, Hutrel d'Arboval,² Gellé,³ Cruzel,⁴ have described under the name of "farcy of the ox" (*farcin du bœuf*) a chronic malady characterised by suppurative inflammation of the superficial lymphatic vessels and glands, rarely fatal, but ultimately rendering itself evident by emaciation, and "by symptoms of tubercular phthisis" (Cruzel).

This affection, formerly frequent, if one may judge by the rather numerous observations contained in the first volumes of the *Recueil de Médecine Veterinaire*, appears to have become very rare to-day, at least in France. Indeed, Zundell, in his re-edition of Hutrel d'Arboval,⁵ and Peuch, in that of Cruzel's work,⁶ do not mention it.

¹ Translated from the *Annales De L'Institut Pasteur*. June 1888. ² Dictionnaire, 2nd edition, 1838.

³ Pathologie bovine, 1846.

⁴ Traité des maladies de l'espece bovine, 1st edition, 1869.

⁵ Dictionnaire, new edition, 1876.

⁶ 2nd edition, 1883.