1936 Kenya

No. 38261

SUBJECT CO 533/475

Bovine Pleuro Pneumonia

Investigation Application to C.D.A.C.

Previous	
18085/32	
Subsequent	
1937	

(7717) Wt.[illegible] H.P.Co.

Dupl. and copy application to Accounts.
llo appln. to Mr. E.S. Smith.

No 6
18085/36

Governor No.509. 26.9.36.

Submits application to the C.D.A.C. for grant of £6,580 for research on the etiology and transmission of contagious bovine pleuro-pneumonia.

In 1932 the Governor submitted an application for assistance from the Colonial Development Fund in connection with a scheme for the control of rinderpest and pleuro-pneumonia in the Masai Reserve. The object of the scheme was two-fold viz:- (a) to reduce the incidence of rinderpest in the Masai Reserve by the suppression of outbreaks with vaccine plus virus, and (b) for intensive research on the etiology and transmission of pleuro-pneumonia, and diagnostic tests. The cost of applying the scheme over a five-year period was estimated at £41,500, of which the Colony was prepared to bear an amount of £15,000. The scheme was submitted to the C.A.C.A.A.H. in the first instance. The first part of the scheme was not approved by the Committee for the reason that the treatment recommended (vaccine plus virus) could only be regarded as experimental, but they were prepared to support an application for research on the lines proposed. It was impossible at the time to arrive at the cost of such research and the Governor was invited, if he so desired, to submit a revised application for assistance towards the research part of the programme.

The application is now submitted, and it is for a free grant of £6,580 over a period of five years to provide for the salary and expenses of a special research officer and a mobile laboratory unit.

In January this year the East African Veterinary Research Co-ordinating Committee recorded the view that research into diagnosis and control of

pleuro-pneumonia

pleuro-pneumonia was one of the most important tasks before the Kabete Laboratory and strongly recommended that an application for assistance from the Colonial Development Fund for this investigation should be supported.

Mr. Stockdale will no doubt comment on this application. It is too late for the application to be submitted to the Colonial Development Advisory Committee at their meeting on the 28th of October. The next meeting is fixed for the 25th of November.

C.A. Grossmith

21.10.36.

J.J. Paskin 21/x

2. C.A.C. 276 — — 22.10.36.

(2) Reference should be made to the Report of the standing Committee on Animal Health on the Report of the Conference on Co-ordination of Veterinary Research in East Africa (a copy of which is enclosed), and particularly to pages 3 and 4 where the views of the Committee on Contagious Bovine Pleuro-pneumonia control are given. It will be seen that the Committee felt that before an application for financial assistance from the C.D. Fund is made by Kenya, steps should be taken to make contact with the work in connexion with this disease now being undertaken in Barotseland in Northern Rhodesia.

It is possible that if the Committee members had had this despatch and memorandum before them, their conclusions might have been framed somewhat differently, and therefore I would suggest that before a final decision is taken, I refer the matter s.o. to Dr. Andrews and Mr. Smith for their views. It is hardly worth while calling a special Committee meeting solely to consider this application.

Do you agree to s.o. reference to Dr. Andrews and Mr. Smith?

J.A. Stockdale
26.10.36.

J.J. Paskin 29/x

I quite agree: but

A) we hear squalls about overstocking and overgrazing and erosion

B) Kenya is trying to reduce its cattle & has actually got a grant for a factory to dispose of a lot.

C) This kind of thing is not really C.D.F. at all. The application is because Kenya is hard up.

D) I should prefer to introduce a new and very deadly disease

E.) The committee may not like it.

However we can act as suggested if Mr Stockdale will do it.

J.E.W. Flood
29.10.

This is "wirt [illegible]" J.

over

3. To Smith, J. — — — 4.11.36.
Andrews, Dr.

4. Kija appn. for C.D.A.C. assistance —

5. Smith, J. — — — 12.11.36
Comments on appn., and urges that it goes forward.

6. Andrews, Dr. F. — — 24.11.36.
gives views on appn. and states it shd. be supported.

It will be seen from (5) and (6) that the veterinary members of the Colonial Advisory Council to which this application has been submitted both recommend that it should be supported.

In January, 1936 the C.D.A.C. had before them an application from the Government of Northern Rhodesia for financial assistance in connection with a projected programme for the eradication of contagious bovine pleuro-pneumonia for the Barotse Province of Northern Rhodesia (C.D.A.C. 1918 and previous papers 1495 and 1509).

The proposed scheme of eradication was based on a system of inoculation and it was proposed to start the campaign by using vaccine imported from territories bordering on Northern Rhodesia, rather than to embark on the production of vaccine locally. I have not seen the papers which give details of the result of this application to the C.D.A.C., but I understand that the Committee agreed to the proposed campaign in principle but wished to postpone final decision until the results of a first years preliminary campaign of investigation were known. Mass vaccination has been successfully used in certain areas in Kenya but as is stated in the enclosure to the application forwarded with (1) this method required a large staff for its administration and the immunity lasts for only a comparatively short period.

The Veterinary Research Conference of 1934 drew attention to the need for further research in regard to the control of pleuro-pneumonia and the sub-Committee of the Colonial Advisory Council of Agriculture and Animal Health emphasized the desirability of concentrating upon improvements in methods of diagnosis

diagnosis. The clear diagnosis of the disease is still difficult, if not impossible, and there is no doubt as to its economic importance to cattle owners not only in Kenya but also throughout Africa. Many areas have to be kept closed in both East and West Africa, owing to the occurrence of the disease and strict quarantine measures and control over the movement of stock have to be enforced. These restrictions are irksome and in some places are a definite detriment to economic development.

I recently had an opportunity of discussing the position of the disease in Kenya with Sir Alan Pim and Mr Milligan and the latter stated that he considered that the financial assistance asked for by Kenya on behalf of its Veterinary Research Institute could be fully justified as a necessity for African territories generally and not only in the interests of Kenya. Mr Milligan in fact thought that the work in Barotseland should go on pari passu with research work in Kenya and that it might be undesirable from the scientific point of view to press on too rapidly with the work in Barotseland before further research work had been done. If this research work is to be undertaken, and it clearly seems to be necessary, it cannot be carried on better than at Kabete and the workers there as well as the Veterinary Officers concerned with the Barotseland campaign should be kept in very close touch with one another and the fullest co-operation be arranged for.

Mr Gedes [illegible] see Barotseland

F. A. Stockdale

27.11.36.

Sir J. Campbell

Yes: the two things are different. Rhodesia is doing a mass attack to kill out the disease in Barotseland by mass vaccination. This, as Kenya points out, can be done but costs a good deal. Therefore Kenya is anxious to go in for really scientific research into diagnosis – up to now uncertain though they have high hopes of a new blood-test method – and thence to possible control. The Kenya work may be of great value to Barotseland and hence close liaison will be expected, but, unless something new is developed in the Barotse campaign, the work there won't help the Kenya research much.

As is pointed out the matter is of great interest to all cattle owning Africa, & Kenya happens to be the best place for the job. It has the laboratory, it has the staff, and it has the cattle both native and imported.

So I think the application is a very good one and one which ought to appeal to the C.D.A.C. If it works then there will be a real advance in scientific knowledge – apart from the material gain over cattle.

J.E.W. Flood
6.1.37

[illegible]
7/1/37

7. C.D.A.C. 2101 — 11.1.37

R.297. Pl. B/U on 26th Jan[uary]
in case the p/p are wanted
noted for the C.D.A.C. meeting on
the 27th January

C. A. Smith
12/1/37

Mr L. S. Smith says the meeting is being held on 27.1.37.
26/1

Brought up
[illegible]
R.297
26.1.37

R.80 [illegible]

R.298. 3/24

C.D.A.C. 2101

COLONIAL DEVELOPMENT ADVISORY COMMITTEE.

Kenya. Etiological investigation of contagious bovine pleuro-pneumonia.

With reference to C.D.A.C. 1918 and 1922, I circulate, for consideration an application from the Government of Kenya for a free grant from the Fund to provide for the salary and expenses, over a period of five years, of a special research officer to carry out an etiological investigation of contagious bovine pleuro-pneumonia with particular reference to factors affecting diagnosis and control.

A Colonial Office memorandum and the usual financial summary are prefixed.

S. CAINE,
Secretary to the Committee.

COLONIAL OFFICE,
11th January, 1937.

FINANCIAL SUMMARY.

1.	Dependency.	Kenya.
2.	Description of scheme.	Etiological investigation of contagious bovine pleuro-pneumonia.
3.	Date of commencement.	As soon as special Research Officer can be engaged.
4.	Period of scheme.	5 years.
5.	Total Cost.	£6,580.
6.	Allocation of cost.	Local: £5,760 U.K. £820.
7.	Assistance desired.	Free grant of £6,580.
8.	Suggested terms of loan.	Not applicable.
9.	Probable yearly amounts required:-	1937/38 £2,320 1938/39 £1,230 1939/40 £1,260 Subsequently £1,770

MEMORANDUM.

26. 9. 36.

The Secretary of State desires to submit, for the consideration of the Committee, the accompanying application from the Government of Kenya for a direct grant of £6,580 to provide for the salary and expenses, over a period of five years, of a special research officer to carry out an etiological investigation of contagious bovine pleuro-pneumonia with particular reference to factors affecting diagnosis and control.

In 1932 the Governor of Kenya submitted an application for assistance from the Colonial Development Fund in connection with a scheme for the control of rinderpest and pleuro-pneumonia in the Masai Reserve. The object of the scheme was twofold:

(a) To reduce the incidence of rinderpest in the Masai Reserve by the suppression of outbreaks with vaccine plus virus; and

(b) To provide for intensive research on the etiology and transmission of pleuro-pneumonia and diagnostic tests.

The cost of applying the scheme over a five year period was estimated at £41,500 of which the Colony was prepared to bear the amount of £15,000. The scheme was submitted to the Colonial Advisory Council of Agriculture and Animal Health in the first instance. The first part of the scheme was not approved by the Council for the reason that the treatment recommended (vaccine plus virus) could only be regarded as experimental, but they were prepared to support an application for research on the lines proposed. It was impossible at the time to arrive at the cost of such

such research and the Governor was invited, if he so desired, to submit a revised application for assistance towards the research part of the programme.

The present application is to cover the cost of the research. The scheme has been examined by the Colonial Advisory Council of Agriculture and Animal Health, and the Veterinary members of the Council strongly support the application. It is considered that the laboratory at Kabete is well equipped for the work, and has already given a good deal of time and attention to the problem, and that the special research worker whom it is proposed to appoint would there receive proper help and guidance. At the same time it is regarded as most desirable that close touch should be maintained between the Veterinary Departments of Kenya and Northern Rhodesia in view of the investigation at present proceeding in Northern Rhodesia preliminary to a campaign to eradicate bovine pleuro-pneumonia from the Barotse Province. In this connection reference is invited to C.D.A.C. 1918 and the Committee's letter of the 27th of January 1936, C.D.A.C. 1922. It is not considered desirable that the research proposed by the Kenya Government should be delayed for the results of the Northern Rhodesia investigation since the Kenya research will be directed mainly to improving the methods of diagnosis of the disease, and will thus be complementary to that in progress in Rhodesia.

The clear diagnosis of the disease is still difficult, if not impossible, and there is no doubt as to

to its economic importance to cattle owners, not only in Kenya but also throughout Africa. Many areas have to be kept closed with both East and West Africa, owing to the occurrence of the disease and strict quarantine measures and control over the movement of stock have to be enforced. These restrictions are irksome and in some places are definitely detrimental to economic development.

The Secretary of State trusts that the Committee will be prepared to recommend a grant of £6,580 from the Colonial Development Fund to cover the cost of this investigation.

COLONIAL OFFICE,
11th January, 1937.

KENYA.

No. 509

Government House,
NAIROBI,
KENYA.
26th September, 1936.

Sir,

With reference to paragraph 3 of Sir Philip Cunliffe-Lister's (now Viscount Swinton's) despatch No. 461 of the 13th June, 1934, regarding the need for research on the etiology and transmission of contagious bovine pleuro-pneumonia, I have the honour to transmit to you, for your consideration, an application for assistance from the Colonial Development Fund in carrying out an etiological investigation of this disease, with particular reference to factors affecting diagnosis and control.

2. I enclose twelve copies each of the form of application, a memorandum relating thereto and a paper (Contagious Bovine Pleuro-Pneumonia : Note on Experimental Reproduction by Contact : R. Daubney, Chief Veterinary Research Officer, Kenya), reprinted from the Journal of Comparative Pathology and Therapeutics, June, 1936. I trust that you will be able to recommend this application.

I have, etc.,

(Sgd.) J. Byrne.

BRIGADIER-GENERAL
GOVERNOR.

THE RIGHT HONOURABLE
W. ORMSBY-GORE, P.C., M.P.,
SECRETARY OF STATE FOR THE COLONIES,
DOWNING STREET,
LONDON, S. W. 1.

Draft

MEMORANDUM.

The Secretary of State desires to submit for the consideration of the Committee, the accompanying application from the Government of Kenya for a direct grant of £6,580 to provide for the salar and expenses over a period of five years, of a special research officer to carry out an etiological investigation of contagious bovine pleuro-pneumonia with particular reference to factors affecting diagnosis and control.

In 1932 the Governor of Kenya submitted an application for assistance from the Colonial Development Fund in connection with a scheme for the control of rinderpest and pleuro-pneumonia in the Masai Reserve. The object of the scheme was twofold

(a) To reduce the incidence of rinderpest in the Masai Reserve by the suppression of outbreaks with vaccine plus virus, and

(b) To provide for intensive research on the etiology and transmission of pleuro-pneumonia and diagnostic tests.

The cost of applying the scheme over a five year period was estimated at £41,500 of which the Colony was prepared to bear the amount of £15,000. The scheme was submitted to the Colonial Advisory Council of Agriculture and Animal Health in the first instanc The first part of the scheme was not approved by the Council for the reason that the treatment recommended (vaccine plus virus) could only be regarded as

experimental

experimental, but they were prepared to support an application for research on the lines proposed. It was impossible at the time to arrive at the cost of such research and the Governor was invited, if he so desired, to submit a revised application for assistance towards the research part of the programme.

The present application is to cover the cost of the research. The scheme has been examined by the Colonial Advisory Council of Agriculture and Animal Health, and the Veterinary members of the Council strongly support the application. It is considered that the laboratory at Kabete is well equipped for the work and has already given a good deal of time and attention to the problem and that the special research worker whom it is proposed to appoint would there receive proper help and guidance. At the same time it is regarded as most desirable that close touch should be maintained between the Veterinary Departments of Kenya and N.Rhodesia in view of the investigation at present proceeding in N.Rhodesia preliminary to a campaign to eradicate bovine pleuro-pneumonia from the Barotse Province. In this connection reference is invited to C.D.A.C.1918 and the Committee's letter of the 27th of January 1936, C.D.A.C. 1922. But it is not considered desirable that the research proposed by the Kenya Government should be delayed for the results of the

N.Rhodesia investigation since Kenya research will be directed mainly to improving the methods of diagnosis of pleuro-pneumonia. The chief aim will thus be complementary to that in progress in Rhodesia.

The clear diagnosis of the disease is still difficult, if not impossible, and there is no doubt as to its economic importance to cattle owners, not only in Kenya but also throughout Africa. Many areas have to be kept closed in both East and West Africa, owing to the occurrence of the disease and strict quarantine measures and control over the movement of stock have to be enforced. These restrictions are irksome and in some places are of definite detriment to economic development.

The Secretary of State trusts that the Committee will be prepared to recommend a grant of £6,580 from the Colonial Development Fund to cover the cost of this investigation.

C.O.

11/1/37

Telephone:—Byfleet 130. Railway Station Passengers:—West Weybridge, 1½ miles; Byfleet, 1½ miles; taxis available. Parcels and Stock:—Addlestone. Telegrams:—Medicum, Addlestone.

MINISTRY OF AGRICULTURE AND FISHERIES.

W. Howell Andrews, D.Sc., M.R.C.V.S., Director.

To avoid delay, address all communications to:— The Director.

Veterinary Laboratory, New Haw, Weybridge, Surrey.

This Reference No. WHA/B. should be quoted.

24th November, 1936.

Dear Carson,

I am sorry that I have not been able to reply sooner to your letter of 4th instant concerning the application from Kenya for assistance from the Colonial Development Fund. I consider that we should support the Kenya application. Kabete is well equipped for the work, and has already given a good deal of time and attention to the problem, and the special research worker whom it is proposed to appoint would therefore receive proper help and guidance. The subject itself is, of course, important to most tropical African territories.

Liaison with the Barotseland work is certainly highly desirable. The experiences of Kabete may help the Barotseland work greatly and enable the workers to overcome some difficulties which may not have been foreseen. On the other hand, the large-scale work in Barotseland should afford an opportunity of checking on the practical side some of the theories developed during the Kabete research and give the research workers valuable information and possibly material.

I think that the necessary contacts should be established by actual visits, and that correspondence would not suffice. The officer in charge of the Barotseland operations should actually see the Kabete laboratory and the methods employed there, if he has not already done so. On the other hand, I think that it would be an excellent thing if someone from Kabete, and, preferably, Daubney himself, could visit Barotseland and discuss matters there with the local workers.

I am returning herewith the copy of the official application.

Yours sincerely,

Howell Andrews

A.D. Garson Esq.,
2, Richmond Terrace,
S.W.1.

Woodleigh
Keeley Lane
Keeley
Surrey.

Dear Garrow,

Thanks for yours of the 16th.

The application from Kenya & the Colonial Development Fund, for work in connection with Pleuropneumonia, is, I think, entirely different from that made by Northern Rhodesia. The latter was for an attempt to eradicate the disease by employing a method which will always be handicapped by the difficulty in diagnosing "border-line" cases. The application from Kenya is for assistance in endeavouring to perfect, as a field operation, a test which appears to have reasonable prospects. If such a test can be made available, it would very considerably simplify & shorten operations against the disease. The Advisory Council, as you are aware, stressed the necessity for work in connection with a diagnostic test.

The application by Kenya may, I think, be looked upon as being on behalf of all the

East African territories, because the 1934 Conference on Co-ordination of Veterinary Research recommended that all work on pleuropneumonia should be carried out at Kabete. The Council supported that & are also, this year, supported the principle of centralised research in so far as this is possible.

I feel that the application is one which should go forward with a strong recommendation. The work suggested in Kenya would in no way be similar to that in Barotseland; it would definitely be of advantage to Northern Rhodesia & would, in my opinion, assist in lessening the time, & therefore the cost, of the operations which are to be commenced. The recommendation that Kenya workers should visit, & keep closely in touch with the work in Northern Rhodesia, is in no way affected.

Yours sincerely

J. Smith

A. J. Garon Esq.
Colonial Office.

pps returned herewith as requested.

East African territories because the 1934 Conference on Co-ordination of Veterinary Research recommended that all work on pleuropneumonia should be carried out at Kabete. The Council supported that view and also, this year, supported the principle of centralised research in so far as this is possible.

I feel that the application is one which should go forward with a strong recommendation. The work suggested in Kenya would in no way be similar to that in Bechuanaland; it would definitely be of advantage to Northern Rhodesia and would, in my opinion, assist in lessening the time, and therefore the cost, of the operations which are to be commenced. The recommendation that Kenya workers should visit, and keep closely in touch with the work in, Northern Rhodesia, is in no way affected.

Yours sincerely,
J. Smith

A. J. Gason, Esq.,
Colonial Office.

pps returned herewith as requested.

APPLICATION FOR ASSISTANCE FROM THE COLONIAL DEVELOPMENT FUND.

PLEURO - PNEUMONIA RESEARCH.

1. Kenya

2. An etiological investigation of contagious bovine pleuro-pneumonia, with particular reference to factors affecting diagnosis and control.

3. As soon as a special Research Officer can be engaged after approval.

4. Five years.

5. £6,580, spread over five years as follows:-

	£	£
First Year:		
(a) Purchase of mobile six-wheel laboratory unit, fitted with refrigerating equipment, special screening centrefuge and special Letapic pulper	1,000	
(b) Salary of one Research Officer to be specially engaged	600	
(c) Passages of Research Officer	120	
(d) Maintenance and running costs of lorry	220	
(e) Labour	85	
(f) Local Transport and Travelling	192	
(g) Travelling Allowance	20	
(h) Purchase of animals	68	
(i) Incidentals	15	2,320
Second Year:		
(a) Salary of Research Officer	630	
(b) Local recurrent expenditure, items (d) to (i) above	600	1,230
Third Year:		
(a) Salary of Research Officer	660	
(b) Local recurrent expenditure	600	1,260
Fourth Year:		
(a) Salary of Research Officer	690	
(b) Local recurrent expenditure	600	1,290
Fifth Year:		
(a) Leave salary of Research Officer	360	
(b) Passages	120	480
Total for five years		£6,580

6. Expenditure incurred in the United Kingdom would extend to the cost of the lorry chassis (say £520) and equipment (say £300).

7. Lack of funds.

8. A direct grant is sought.

9. A memorandum is annexed.

10. Direct grant.

At the present time pleuro-pneumonia exists and is more or less prevalent in most of the native pastoral areas of the Colony, particularly the Northern Frontier Province, the Masai and the East Suk districts. These areas are virtually retained in a state of perpetual quarantine, with resultant administrative difficulties and loss of trade and revenue. The quarantine imposed has no practical value in the direction of eradication, and cannot be lifted without considerable risk to the clean areas since the disease persistently recurs even after long periods of quarantine.

2. Eradication by slaughter of infected and in-contact animals is impracticable in Kenya. In the past mass-vaccination has been successfully employed to clear large areas of the Colony of this disease; but the method is laborious, requires a large staff for administration, and the immunity lasts for a comparatively short period only. The areas from which the disease has already been eradicated are in general closely settled. Eradication from the pastoral reserves in which the people are nomadic offers greater difficulty.

3. In January, 1934 the Conference on Co-ordination of Veterinary Research, held at Kabete, drew attention to the great economic importance of contagious bovine pleuro-pneumonia in a stock-raising country and to the need for further research into its etiology and control. The Conference agreed that in view of the programme of work already in hand at the Kabete Veterinary Laboratory pleuro-pneumonia research should be concentrated in that institute.

4. The Sub-committee of the Colonial Advisory Council on Agriculture and Animal Health which reported on the findings of this Conference attached considerable importance to the suggestions made for research on this disease particularly in connexion with improvements in methods of diagnosis and vaccination.

5. In January, 1936 the Veterinary Research Co-ordinating Committee, which had been appointed in pursuance of a conclusion recorded by the Governors' Conference in April, 1935 recorded the view that research into diagnosis and control of pleuro-pneumonia was one of the most important tasks before the Kabete Laboratory and strongly recommended that an application for assistance from the Colonial Development Fund for this investigation should be supported.

6. A copy is appended of a paper (Contagious Bovine Pleuro-pneumonia : Note on Experimental Reproduction and Inspection by Contact : R. Daubney, Chief Veterinary Research Officer, Kenya) reprinted from the Journal of Comparative Pathology and Therapeutics, June, 1935. The note indicates that progress is possible. The methods of infection described in this paper have since been confirmed by workers in Australia, where a scheme of co-operative investigation, with assistance from the Empire Marketing Board up to a maximum of £5,000 per annum, has been in progress. The results of roughly four years' work were published this year in Bulletin No. 97 (Studies on Contagious Pleuro-pneumonia of Cattle). The chief practical result obtained is the standardization of a complement fixation test for the diagnosis of this disease. It is claimed that this test has been perfected as an intrument for the eradication of contagious bovine pleuro-pneumonia. The technique of the test, as employed by the Australian workers, does not differ, apart from certain refinements, from the test as arranged by Mr. Daubney in Kenya in 1926. Unfortunately the investigation of the test had to be abandoned in Kenya on account of the demands which it made on the time of the research staff. It is now highly important that this work should be resumed with a view to ascertaining whether the complement fixation test provides an instrument for the control of the disease under Kenya conditions. The research

staff look to the development of such a diagnostic test to enable them finally to eradicate the disease from the Colony.

C. O.

Mr. Garson
Mr. Stockdale
Mr.
Sir C. Parkinson.
Sir G. Tomlinson.
Sir C. Bottomley.
Sir J. Shuckburgh.
Permt. U.S. of S.
Parly. U.S. of S.
Secretary of State.

DRAFT.

DR.W.HORNER ANDREWS, M.R.C.V.S.,
J.SMITH, ESQ., O.B.E., M.R.C.V.S.

All encls. to (1) (Spares are with Mr.L.S.Smith).

2, Richmond Terrace,
Whitehall, S.W.1.

November 1936.

Mr.Smith
Dear Dr.Andrews,

Referring to page 3 of the last report of the Standing Committee on Animal Health, (which was circulated on the 22nd October), you will remember that it was foreshadowed that an approach would come from Kenya for assistance from the Colonial Development Fund for a campaign against contagious bovine pleuro-pneumonia. The Committee considered that before any such approach was made the Veterinary Department in Kenya should get into touch with the Veterinary Department in Northern Rhodesia, in order that there should be collaboration between the workers in Kenya and those in Barotseland at present engaged with this disease.

We

FURTHER ACTION.

C. O.

Mr. Garson
Mr. Stockdale
Mr.
Sir C. Parkinson.
Sir G. Tomlinson.
Sir C. Bottomley.
Sir J. Shuckburgh.
Permt. U.S. of S.
Parly. U.S. of S.
Secretary of State.

2, Richmond Terrace,
Whitehall, S.W.1.

November 1936.

DRAFT.

DR.W.HORNER ANDREWS, M.R.C.V.S.,
J.SMITH, ESQ., O.B.E., M.R.C.V.S.,

Dear Mr.Smith / Dr.Andrews,

Referring to page 3 of the last report of the standing Committe on Animal Health, (which was circulated on the 22nd October), you will remember that it was foreshadowed that an approach would come from Kenya for assistance from the Colonial Development Fund for ~~a~~ a campaign against contagious bovine pleuro-pneumonia. ~~pneumonia campaign.~~ The Committee considered that before any such approach was made the Veterinary Department in Kenya should get into touch with the Veterinary Department in Northern Rhodesia, in order that there should be collaboration between the workers in Kenya and those in Barotseland at present engaged with this disease.

All encls. to (1)
(Spares are with Mr.L.S.Smith)

FURTHER ACTION.

We have now had a formal application from the Governor of Kenya and while it hardly seems worth calling a meeting of the standing Committee, we should be very glad if you would be good enough to let us have your comments on it. I enclose a copy of the application as received from the Governor of Kenya. Would you be good enough to return the copy with any comments that you give us as there is rather a limited supply.

Yours sincerely,

A. D. GARSON

COLONIAL ADVISORY COUNCIL OF AGRICULTURE AND ANIMAL HEALTH

C.A.C.296.

Standing Committee on Animal Health.

I now circulate the report of the standing Committee on Animal Health in revised form which was previously circulated in draft on the 17th October, 1936. Certain amendments were made to this report in Council at the meeting on the 21st October, 1936.

A. D. GARSON

Secretary.

COLONIAL OFFICE.

22nd October, 1936.

COLONIAL ADVISORY COUNCIL OF AGRICULTURE AND ANIMAL HEALTH

C.A.C.296.

Report of the standing Committee on Animal Health.

The following papers were referred to the standing Animal Health Committee for examination:-

1. The Report of the Conference on Co-ordination of Veterinary Research in East Africa, held at Kabete, January, 1936. (C.A.C.286).
2. Memorandum on the Economics of the Cattle Industry in Northern Rhodesia with special reference to the Native Cattle Industry. (C.A.C.285).

The members of the Committee who were present at the meeting on the 12th October were:-

Mr.F.A.Stockdale, C.M.G., C.B.E., (In the Chair)
Dr.W.Horner Andrews, M.R.C.V.S.,
Mr.J.Smith, O.B.E., M.R.C.V.S.,
Mr.A.D.Garson (Secretary)

Apologies for inability to attend were received from Sir John Orr, D.Sc., M.D., F.R.S., Mr.J.W.McIntosh, F.R.S.E., M.R.C.V.S., and Dr.O.Charnock Bradley, F.R.C.V.S.

1. The Report of the Conference on Co-ordination of Veterinary Research in East Africa, held at Kabete, January, 1936.

Rabies. (Pages 7-12).

The Committee noted with satisfaction the measures which had been taken in connexion with this disease and agreed that the attempts at fixation of local strains of virus should continue.

Contagious Abortion. (Pages 12-16).

The Committee noted with interest the discussion

that took place at the Conference and considered that further investigations on the apparent mutation of Melitensis and Abortus strains should be continued. It was felt, in view of the extent to which research in connexion with this disease was being carried out both in the United Kingdom and in America, that it was desirable for the research work in East Africa to be confined to the scope approved by the Conference.

Tuberculosis. (Pages 16-19).

The Committee noted with satisfaction the account of the work being carried out in Uganda and recommended that it be continued at the Veterinary Laboratory, Entebbe.

Measles in Cattle and Pigs. (Pages 19-24).

While the Committee agreed with the recommendations of the Conference that more stringent measures should be taken to assist the eradication of this disease when it was possible, they felt that the ultimate goal of eradication could only be achieved by improvement of sanitary conditions.

Rinderpest. (Pages 24-38).

The Committee noted with interest the account of the progress that was being made with inactivated vaccine and agreed that work should be continued on these lines. They endorsed the programme of research as detailed on page 38 of the Report. Having regard to the good results which had been obtained with goat virus in India it might be considered desirable to have a further test with goat virus made in East Africa.

The Committee noted that the Conference agreed that the necessity for charging fees was a serious hindrance to the control of rinderpest. They felt that as complete control was the objective to be aimed at it was undesirable that individuals should be precluded from co-operating for the general good on account of their inability to pay a fee. They considered that in the light of the experience of other East African Governments the Government of Kenya might consider the advisability of adopting the practice which had been accepted in the other East African territories of performing this service without fee. It appeared that until this policy was adopted by the Government of Kenya the control of the disease in the Masai reserves was made unduly difficult.

Anthrax. (Pages 44-46).

The Committee agreed that research on this subject should be continued as the economic loss caused by this disease was considerable.

Contagious Bovine Pleuro-pneumonia. (Pages 46-50).

The Committee felt that before any approach was made to the Colonial Development Advisory Committee to recommend the grant of funds from the Colonial Development Fund to enable the study of this disease in the field in Kenya, steps should be taken to get into touch with the work designed to effect the eradication of this disease from Barotseland in Northern Rhodesia, ~~with a grant from the Colonial Development Fund~~. It might be advantageous for an East African officer to keep in touch with and to visit the workers in Barotseland. Such

collaboration might result in some of the problems of East Africa in regard to this disease receiving special attention in Northern Rhodesia whilst the work there was in progress, and the results in Northern Rhodesia might strengthen any claim which might be made for assistance from the Colonial Development Fund for work in East Africa.

East Coast Fever. (Pages 51-62).

The Committee noted and agreed with the recorded opinion of the Conference that progressive cattle farming is only possible in the absence of East Coast Fever. In view of the increasing importance of mixed farming to the native of Africa it was felt that it was most desirable that further research on this disease should be prosecuted with vigour and that its complete eradication should eventually be aimed at.

Mange. (Page 63).

The Committee agreed that in view of the importance to the native producer of hides and skins experiments on the control of mange should be continued.

Poultry Diseases. (Pages 68 and 69).

It was felt that in view of the considerable amount of work now being undertaken in the United Kingdom and elsewhere on poultry diseases, work in East Africa should be mainly confined to diagnosis.

Newcastle Disease. (Page 68).

The Committee noted that a disease which appeared to be identical with Newcastle Disease had made its appearance in Kenya. They felt that drastic action

was called for to prevent it spreading. It was understood that the adoption of measures were being considered in this country to make it possible to order the compulsory slaughter of infected birds with compensation to the owners and it might be that compulsory slaughter should be contemplated for East Africa. The Committee suggested that it might be beneficial if, when Veterinary officers had no specialized knowledge of poultry diseases, that at least one officer from each of the East African territories were afforded study leave for work on poultry diseases when opportunity offered. Other colonial dependencies had made provision for study leave in connexion with poultry husbandry and poultry diseases and the results had been encouraging. Producers had benefited considerably from the assistance which had been afforded them by an officer with specialized knowledge of poultry and their diseases.

Nutrition and Reproduction. (Pages 75-77).

The Committee considered that it was most desirable that research workers in East Africa should keep in touch with the experiments that were being carried out at the Rowett Institute, Aberdeen, and in Edinburgh.

Animal Nutrition in Relation to Grassland Improvement. (Pages 77-82)

The Committee noted with interest the work of Mr. Edwards on this subject and they desired to stress the need for continued fundamental studies of pasture problems in all the East African territories.

Co-ordination of Veterinary Research. (Pages 82-86)

The Committee agreed that a centralization of

veterinary research was most desirable as being economical of apparatus and of assistants. It also provided for the degree of specialisation that was essential. It was felt that territorial laboratories should be reasonably equipped for purposes of diagnosis and a certain measure of research, the centralization of research would enable better laboratory equipment to be available and for team work by specialists to be provided for. It was also felt that Northern Rhodesia and Nyasaland might with advantage co-operate in such a scheme, having regard to the nature of the veterinary problems of those two territories.

While the Committee considered that visits to such a research station by Veterinary Officers were under certain circumstances desirable, they did not consider that any attempt should be made to build up a teaching side at the laboratory. They considered that the primary object of such a Station should be research and that visits from research workers in the territorial laboratories would be most desirable.

2. Memorandum on the Economics of the Cattle Industry in Northern Rhodesia with special reference to the Native Cattle Industry.

The Committee read this memorandum with considerable interest and in view of the situation disclosed felt that some comment was called for. It seemed clear that the native cattle of Northern Rhodesia provide at the present time between 60 and 70 per cent. of the cattle which are required from the territory for slaughter purposes. They also provide the reservoir from which Europeans draw their supplies for building up their herds. It is expected that this will continue to be the case in the future, and the native stock

must provide the basic material on which upgrading by European stock owners is built and selected native stock may be required for deep ploughing unless pasture improvement is expedited. It is clearly therefore of primary importance to take steps to maintain and to improve the native cattle in the interests of the community as a whole. The proceeds of the cattle levy fund may, in providing assist a means of effecting an improvement of the native stock and it seems to the Committee that it would be equitable for a proportion of the surplus in the levy fund to be devoted to the improvement of the native cattle industry and that this proportion should be equivalent to the ratio which the value of native cattle slaughtered bore to the total value of local stock slaughtered in the territory and liable to the cattle levy.

The Committee consider that the question may be approached in several ways. Firstly, attention should be given to the improvement of water supplies and to work designed to effect improvements in pasture management and to prevent excessive soil erosion. The improvement of livestock is limited by the nutritional standard which the grazing provides and it is clear, therefore, that attention must first be given to water supplies and to pasture management on the grazing areas. Careful studies of pasture problems have already begun in Kenya and Tanganyika and much information of value has already been obtained. Pasture investigation work has been started by the Zoologist in Northern Rhodesia but it seems to the Committee that further investigational work on pasture problems is required. Attention should also be given to the improvement of the native cattle and to the provision of

better facilities for marketing. With regard to stock improvement it seems desirable to proceed with selection among native herds and the extension of castration. The Committee feel the establishment of bull camps (of selected animals) might be considered. The Dippingtanks might form suitable locations for the establishment of bull camps. If and when the introduction of graded bulls appears to be desirable selection of the breeds employed should be governed by the potentialities of the areas in regard to beef production, dairying, or both. The Committee desire, however, to stress that any permanent improvement of stock is unlikely to be achieved unless pasture improvements are carried out simultaneously. They feel that there is an urgent need for fundamental research in this direction as the increase of erosion and despoilation of forests make the food and water supplies for native cattle more precarious every year.

As to markets, the Committee noted with interest that the Governor was contemplating the abolition of the barter trade in cattle. It could not be too strongly stressed that the native interest in improved cattle could be increased only by the extension of cash trading for cattle. The Committee recommend that consideration should be given to the possibility of establishing a market at a small number of selected locations under the supervision of the Administration where cattle sales for cash could be provided for. In Uganda, supervised markets, where natives can purchase meat from other natives, are meeting with increasing success and the possibilities of similar markets, in suitable districts, might be explored in Northern Rhodesia. The memorandum emphasises that the number of cattle slaughtered for consumption in the villages is small. The Committee feel that active effort to endeavour to

increase this number, by encouraging the slaughter of less desirable animals, would be of benefit to the industry and the natives themselves.

The Committee considered that the report was a valuable record of the present state of the cattle industry in Northern Rhodesia and whilst realizing that the greater emphasis had been given to the raising and marketing of beef cattle, it was necessary to recognise that the need for dairy products both in the urban and mining areas and also amongst the native communities themselves was of the utmost importance. Supplies of fresh milk and butter were required and it might be possible to establish a ghee industry in the Reserves. Progress in the production of ghee from native stock was being made in Nigeria, Tanganyika and Kenya and efforts to test the possibility of establishing a similar industry in Northern Rhodesia seemed worthy of consideration.

R. A. STOCKDALE
Chairman.

A. D. GARSON
Secretary.

COLONIAL OFFICE.
22nd October, 1936.

1808/32

KENYA.

No. 509

GOVERNMENT HOUSE,
NAIROBI,
KENYA.
26 SEPTEMBER, 1936

RECEIVED
29 OCT 1936
C.O. REGY

Sir,

With reference to paragraph 3 of Sir Philip Cunliffe-Lister's (now Viscount Swinton's) despatch No. 461 o the 13th June, 1934, regarding the need for research on th etiology and transmission of contagious bovine pleuro-pneumonia, I have the honour to transmit to you, for your consideration, an application for assistance from the Colonial Development Fund in carrying out an etiological investigation of this disease, with particular reference to factors affecting diagnosis and control.

2. I enclose twelve copies each of the form of application, a memorandum relating thereto and a paper (Contagio Bovine Pleuro-Pneumonia : Note on Experimental Reproduction by Contact : R. Daubney, Chief Veterinary Research Officer, Kenya), reprinted from the Journal of Comparative Pathology and Therapeutics, June, 1935. I trust that you will be able to recommend this application.

I have the honour to be,

Sir,

Your most obedient, humble servant,

BRIGADIER-GENERAL
GOVERNOR

THE RIGHT HONOURABLE
W. ORMSBY-GORE, P.C., M.P.,
SECRETARY OF STATE FOR THE COLONIES,
DOWNING-STREET,
LONDON, S.W. 1.

PLEURO - PNEUMONIA RESEARCH.

1. Kenya

2. An etiological investigation of contagious bovine pleuro-pneumonia, with particular reference to factors affecting diagnosis and control.

3. As soon as a special Research Officer can be engaged after approval.

4. Five years.

5. £6,580, spread over five years as follows:-

	£	£
First Year:		
(a) Purchase of mobile six-wheel laboratory unit, fitted with refrigerating equipment, special screening centrefuge and special Latapic pulper	1,000	
(b) Salary of one Research Officer to be specially engaged	600	
(c) Passages of Research Officer	120	
(d) Maintenance and running costs of lorry	220	
(e) Labour	85	
(f) Local Transport and Travelling	192	
(g) Travelling Allowance	80	
(h) Purchase of animals	68	
(i) Incidentals	15	2,320
Second Year:		
(a) Salary of Research Officer	630	
(b) Local recurrent expenditure, items (d) to (i) above	600	1,230
Third Year:		
(a) Salary of Research Officer	660	
(b) Local recurrent expenditure	600	1,260
Fourth Year:		
(a) Salary of Research Officer	690	
(b) Local recurrent expenditure	600	1,290
Fifth Year:		
(a) Leave salary of Research Officer	360	
(b) Passages	120	480

6. Expenditure incurred in the United Kingdom would extend to the cost of the lorry chassis (say £520) and equipment (say £300).

7. Lack of funds.

8. A direct grant is sought.

9. A memorandum is annexed.

10. Direct grant.

MEMORANDUM RELATING TO AN APPLICATION FOR ASSISTANCE FROM THE COLONIAL DEVELOPMENT FUND FOR PLEURO-PNEUMONIA RESEARCH.

At the present time pleuro-pneumonia exists and is more or less prevalent in most of the native pastoral areas of the Colony, particularly the Northern Frontier Province, the Masai and the East Suk districts. These areas are virtually retained in a state of perpetual quarantine, with resultant administrative difficulties and loss of trade and revenue. The quarantine imposed has no practical value in the direction of eradication, and cannot be lifted without considerable risk to the clean areas since the disease persistently recurs even after long periods of quarantine.

2. Eradication by slaughter of infected and in-contact animals is impracticable in Kenya. In the past mass-vaccination has been successfully employed to clear large areas of the Colony of this disease; but the method is laborious, requires a large staff for administration, and the immunity lasts for a comparatively short period only. The areas from which the disease has already been eradicated are in general closely settled. Eradication from the pastoral reserves in which the people are nomadic offers greater difficulty.

3. In January, 1934 the Conference on Co-ordination of Veterinary Research, held at Kabete, drew attention to the great economic importance of contagious bovine pleuro-pneumonia in a stock-raising country and to the need for further research into its etiology and control. The Conference agreed that in view of the programme of work already in hand at the Kabete Veterinary Laboratory pleuro-pneumonia research should be concentrated in that institute.

4. The Sub-committee of the Colonial Advisory Council on Agriculture and Animal Health which reported on the findings of this Conference attached considerable importance to the suggestions made for research on this disease particularly in connexion with improvements in methods of diagnosis and vaccination.

5. In January, 1936 the Veterinary Research Co-ordinating Committee, which had been appointed in pursuance of a conclusion recorded by the Governors' Conference in April, 1935 recorded the view that research into diagnosis and control of pleuro-pneumonia was one of the most important tasks before the Kabete Laboratory and strongly recommended that an application for assistance from the Colonial Development Fund for this investigation should be supported.

6. A copy is appended of a paper (Contagious Bovine Pleuro-pneumonia : Note on Experimental Reproduction and Inspection by Contact : R. Daubney, Chief Veterinary Research Officer, Kenya) reprinted from the Journal of Comparative Pathology and Therapeutics, June, 1935. The note indicates that progress is possible. The methods of infection described in this paper have since been confirmed by workers in Australia, where a scheme of co-operative investigation, with assistance from the Empire Marketing Board up to a maximum of £5,000 per annum, has been in progress. The results of roughly four years' work were published this year in Bulletin No. 97 (Studies on Contagious Pleuro-pneumonia of Cattle). The chief practical result obtained is the standardization of a complement fixation test for the diagnosis of this disease. It is claimed that this test has been perfected as an intrument for the eradication of contagious bovine pleuro-pneumonia. The technique of the test, as employed by the Australian workers, does not differ, apart from certain refinements, from the test as arranged by Mr. Daubney in Kenya in 1926. Unfortunately the investigation of the test had to be abandoned in Kenya on account of the demands which it made on the time of the research staff. It is now highly important that this work should be resumed with a view to ascertaining whether the complement fixation test provides an instrument for the control of the disease under Kenya conditions. The research

staff look to the development of such a diagnostic test to enable them finally to eradicate the disease from the Colony.

[Reprinted from "The Journal of Comparative Pathology and Therapeutics."
Vol. XLVIII. Part 2. June, 1935.]

CONTAGIOUS BOVINE PLEURO-PNEUMONIA. NOTE ON EXPERIMENTAL REPRODUCTION AND INFECTION BY CONTACT.

By R. Daubney.
Chief Veterinary Research Officer, Kenya.

Although it is now 36 years since Nocard and Roux were able by the aid of an ingenious technique to demonstrate the presence of an organism in the lymph from cases of contagious bovine pleuro-pneumonia, it has not yet been possible to satisfy Koch's postulates, *i.e.*, to demonstrate conclusively the ætiological significance of the organism. All attempts to reproduce the disease by inoculation of virulent thoracic lymph or pure cultures of the organism have failed, whatever the method of inoculation employed—whether subcutaneous, intravenous, intratracheal, intraperitoneal, intrapleural, or intracerebral. Indeed one has at times been driven to speculate whether the explanation of these repeated failures might not be that the disease was after all a true virus disease, with the familiar organism playing the rôle of a mere secondary invader or *bacille de sortie*.

A striking feature in the relationship between the organism and the disease is the fact that the organism when injected subcutaneously in culture or lymph, even in minute amount, will provoke intense œdematous reactions which frequently terminate fatally. It has been claimed with some justification that the essential nature of the inflammatory process in the subcutaneous tissues is identical with that of the lung changes in a natural case, but again it is astonishing that even in fatal cases and even where the infective material has been inoculated into the pleural cavity the lungs have never been attacked. There is, however, a certain parallelism in the relations that obtain between the pneumonic form of bovine hæmorrhagic septicæmia and its causal organism *Pasteurella boviseptica*; although in this instance the lung changes simulating those of pleuro-pneumonia are only rarely found in natural cases of the disease, and subcutaneous swellings of the type provoked by inoculation of the organism are the rule in natural infections.

Little is known concerning the spread of bovine pleuro-pneumonia under natural conditions and Dahmen and Ziegler

(1929) adequately sum up the position in the sentence "Der natürliche Infektionsweg ist noch nicht genau bekannt." The incubation period is generally stated to be from two to eight weeks, but apart from the single successful experiment of Chauveau and Nocard, in which the infection was obtained by joining together the heads of an infected and a healthy animal with a tube of linen, there is no record of contact infection ever having been induced under controlled experimental conditions.

In spite of these glaring deficiencies in our knowledge of the ætiology of the disease it has been possible to stamp out bovine pleuro-pneumonia in most parts of Northern Europe by the slaughter of infected and in-contact animals. Where large expanses of infected territory in such countries of Africa are to be administered, and particularly in those areas inhabited by nomadic pastoral tribes, the adoption of the slaughter policy is unfortunately not practicable; and it becomes necessary to rely upon the operation of quarantine or segregation measures, coupled with vaccination, to control the spread of a disease in which a proportion of clinically recovered animals remain infective for prolonged periods. It is under such conditions that the paucity of accurate experimental data on the disease is most keenly felt; and when one has also the added problem of protecting clean areas (under both white and native settlement) against frequent re-invasion from adjacent infected native territories, the need for further reliable information on the nature of the infection becomes even more pressing.

Of the serological tests that have so far been devised for the detection of carrier-animals or "lungers," none has been an unqualified success under African conditions, and although certain factors to explain their failure are brought to light in this note it is extremely doubtful, for the reasons given, whether it will ever be possible to base control entirely on any diagnostic test.

With the requirements of tropical countries in mind, it was decided to make a further attempt to reproduce the disease artificially and, if possible, to study infection by contact under experimental conditions. The object of this note is to record the progress that has already been made in this direction, and to indicate the technique that has led to successful results.

INTRATRACHEAL INOCULATION.

The first attempts at artificial infection were made by the intratracheal route, using virulent thoracic lymph filtered through a British Berkefeld filter or a Chamberland L7 filter. Tests carried out previously had shown that the organism regularly passes the Berkefeld and is always retained by the L7. The method of inoculation was to puncture the wall of the trachea with a canula or coarse hypodermic needle, and then to pass the needle of the inoculating syringe through the canula and into the

lumen of the trachea. After injection of the inoculum a clean syringe was fitted to the inoculating needle and several c.c. of normal saline were forced through to free it of all traces of virus. It will be observed that in spite of these precautions several of the inoculated animals contracted severe subcutaneous swellings at the site of inoculation.

Two animals were inoculated intratracheally with each filtrate, and three animals inoculated subcutaneously in the shoulder served as controls for the infectivity or sterility of the filtrates. The results of this series of inoculations are tabulated below. In the one positive case, to which a brief reference was made in the Annual Report for 1932, a temperature reaction commenced on the 18th day after inoculation, and in the course of the next few

FIG. 1.

Section of lung of X4730. Acute pleuro-pneumonia produced by intratracheal inoculation of filtered lymph. (Hæmatoxylin and Eosin. Low magnification.)

days this animal developed an acute pleuro-pneumonia, in which the right lung became almost completely hepatised. There was an extensive pleuritic effusion detectable clinically, and the animal died on the 29th day of experiment.

Post-mortem there was a considerable quantity of exudate in the pleural cavity with fine fibrinous coagula. The affected right lung was enlarged and covered with a thick tough pellicle formed from coagulated and organised pleural exudate.

Macroscopically the lung picture was quite typical of the acute type of disease, with no attempt at resolution, and the characteristic parenchymatous and interstitial changes were most marked. Histologically the lesion was pathognomonic. (Fig. 1.)

TABLE I.

No. of Animals.	Attempted Infection—26.7.32. Site of Inoculation.	Material.	Result.	Immunity Test—29.8.32. Site of Inoculation.	Material.	Result.	Agglutinin-Precipitin or Agglutination Tests. 1 Month after 1st Inoculation.	After Immunity Test Inoculation.
7332	Intratracheal	Dilute Berkefeld filtrate of lymph from natural case SB3135	No apparent reaction	Subcutaneous shoulder	Berkefeld filtrate of lymph from X4726	No reaction	—	—
4726	"		Clinical pleuro-pneumonia (cultures +) 27.8.32 †	...		...	...	...
7751	Subcutaneous shoulder		Severe subcutaneous reaction 30.8.32 †	Subcutaneous shoulder		...	...	...
7745	Subcutaneous shoulder		Severe subcutaneous reaction 30.8.32 †	Subcutaneous shoulder		...	...	...
6358	Intratracheal	Dilute L7 filtrate of lymph from natural case SB3135	No apparent reaction	Subcutaneous shoulder	Berkefeld filtrate of lymph from X4726	Mild reaction	—	± to +
7274	"		No apparent reaction	Subcutaneous shoulder		No reaction	—	++
7331	Subcutaneous shoulder		No apparent reaction	Intratracheal		No apparent reaction	+	+++

† Died. + Positive. ± Doubtfully positive.

A culture of the organism was obtained from a Berkefeld filtrate of the thoracic lymph, and this filtrate also provoked severe reactions that proved fatal in four animals out of six that were inoculated either subcutaneously or into the trachea with escape of some of the inoculum into the subcutaneous tissues. (*Vide* Table II.) Pure cultures were also recovered by direct seeding of the pleural exudate. It will be observed that the L7 filtrate of the same lymph did not give rise to any reactions either in the animal subcutaneously inoculated or in the two inoculated intratracheally. Subsequent immunity tests indicate that some immunity may have been derived from the inoculations of L7 filtrate, since, of six fresh animals inoculated with the Berkefeld filtrate of lymph from 4726 (Table II), four referred to above developed fatal reactions, while of the three animals previously treated with L7 filtrate (Table I) none reacted severely.

The remaining animal in this series, No. X7332, inoculated with a Berkefeld filtrate was also immune, although apparently he did not react to the original intratracheal injection.

I am indebted to Mr. J. R. Hudson for the carrying out of the first series of intratracheal inoculations, which include the only positive transmission by this route.

In the second experiment twelve cattle were inoculated: four intratracheally and two subcutaneously with a Berkefeld filtrate of lymph from X4726; four intratracheally and two subcutaneously with an L7 filtrate of the same lymph. The results of these inoculations are recorded in Table II, together with the results of immunity tests performed on the survivors. No transmissions were obtained in this series, although one animal, X7832, showed considerable congestion and enlargement of the lungs, possibly hypostatic in origin, at death, without any severe subcutaneous reaction at the site of inoculation.

Two further attempts to transmit by intratracheal injection of Berkefeld filtrates of shoulder lymph also failed, although twelve animals were inoculated. In the 2nd, 3rd and 4th series there were four accidents due to infection of the subcutaneous tissue during intratracheal inoculation and in each case the local reaction was responsible for death, but there were no lung changes in spite of the certainty that most of the inoculated virus had been deposited in the trachea.

EMBOLUS PRODUCTION.

Transmission was next tried by intrajugular inoculation of virulent lymph or pure culture included in emboli of 2-3 per cent. agar; the technique follows that devised by Tuttle (1933) for the production and study of pulmonary abscesses in the dog. A measured quantity of lymph or of centrifuged broth culture is mixed with a few cubic centimeters of 10 per cent. agar and is then drawn up into a metal canula of about one-sixteenth of an

TABLE, II.

Attempted Infection—29.8.32.				Immunity Test.				
							Agglutinin-Precipitin or Agglutination Tests.	
No of Animals.	Site of Inoculation.	Material.	Result.	Site of Inoculation.	Material.	Result.	1 Month after 1st Inoculation.	After Immunity Test Inoculation.
8068	Intratracheal		Severe subcutaneous reaction 22.9.32 †	....	....	....	....	....
8069	"		Severe subcutaneous reaction 25.9.32 †	....	....	....	....	....
7891	"		No apparent reaction	Subcutaneous shoulder 24.11.32	Pure culture 5th generation X8068	Mild reaction	—	++
7998	"	Dilute Berkefeld filtrate of lymph from X4726	Severe subcutaneous reaction 17.9.32 †	....	....	....	....	....
8058	Subcutaneous shoulder		Severe reaction 10.9.32 †	....	....	....	+++	....
8051	Subcutaneous shoulder		Mild local reaction	Subcutaneous shoulder 24.11.32	Lymph from X7904	Mild reaction	+++	+++
7743	Intratracheal		No apparent reaction	Subcutaneous shoulder 24.11.32	Pure culture 5th generation X8068	Mild reaction	±	+
7761	"		No apparent reaction	Subcutaneous shoulder 24.11.32	Pure culture 5th generation X8068	Marked reaction	—	++
7556	"	Dilute 1/7 filtrate of lymph from X4726		Subcutaneous shoulder 24.11.32	Pure culture 5th generation	Marked reaction	±	+
7638	"			Subcutaneous shoulder 24.11.32	Pure culture 5th generation	No reaction	+	+
7832	Subcutaneous shoulder			Subcutaneous shoulder 24.11.32	Lymph from X8068	Very mild reaction.	±	...
7790	Subcutaneous shoulder			Subcutaneous shoulder 24.11.32	Lymph from X8068	No reaction*	+	+

\+ Positive. ± Doubtfully positive. * Later became negative to serological test 1 month after inoculation.

inch above that has previously been lubricated with glycerin. The jugular vein of the animal is punctured with a large bleeding trocar and canula, and after the trocar has been withdrawn, the smaller canula containing the embolus is inserted through the large one. The embolus is now forced out into the lumen of the vein by an injection of normal saline from a syringe that has been attached to the small canula by a rubber connection.

Injection with Thoracic Lymph.

Two cattle, Nos. X7927 and X7928, were inoculated in this manner, each with 1 c.c. of thoracic lymph.

X7927 showed a small local swelling during the third week after inoculation but this swelling receded rapidly and had disappeared within five days. During the fourth week after inoculation a temperature reaction developed, but no definite lung changes could be detected by clinical examination. This reaction lasted seven days, the highest morning temperature, 104·2°, being recorded on the 27th day after inoculation. (Chart 1). On the 10th day, that is just when the subcutaneous reaction was subsiding, the serum of X7927 gave a strongly positive result to the agglutination-test. Tested again during the thermal reaction on the fourth week he gave a doubtful result, but again became strongly positive on the sixth week and continued positive until death. Clinically the animal remained apparently healthy for a period of three weeks and was then destroyed for *post-mortem* examination—eight weeks after inoculation and four weeks after the peak of the temperature reaction. At *post-mortem* examination there was no exudate in the thoracic cavity but there was a firm adhesion of the right lung to the chest wall over an area of roughly 2-in. in diameter. Beneath this adhesion lay an encapsuled oval sequestrum measuring roughly 1½-in. × 2½-in. The surrounding tissues for a distance varying from ½-in. to ¾-in. from the periphery of the sequestrum showed some slight interstitial thickening, but no definite hepatisation. In the left lung there was one small encapsuled lesion about the size of a pea which contained caseous material. No culture was obtained, but histologically the lesion in the right lung was typical for an organising sequestrum. The site of inoculation was normal.

The companion animal, X7928, never had any local swelling. During the second week after inoculation he developed a febrile reaction which lasted roughly nine days. On the 16th day, *i.e.*, towards the end of the thermal reaction, X7928 gave a strongly positive result to the agglutination test; this result was confirmed several times before he was destroyed. There were no clinical symptoms and the animal remained in fair condition for seven weeks after inoculation and was then destroyed. *Post-mortem* there was no exudate in the thoracic cavity, but on the right side

there were two circumscribed adhesions and lying beneath them were two lesions, each about 3/4 in. in diameter, fairly well separated from the healthy tissue. Towards the periphery the tissue of the lesions was organised and straw-coloured, while in the centre it was deep, dull crimson and homogeneous in texture. In the left lung there were three smaller lesions ranging from 2 in. to 3 in. in diameter, and in the largest the tissue had undergone a marked softening. Over each of these lesions there was an adhesion to the parietal pleura. Cultures were not obtained, but histologically the lesions were diagnostic.

Infection with Culture from Thoracic Lymph.

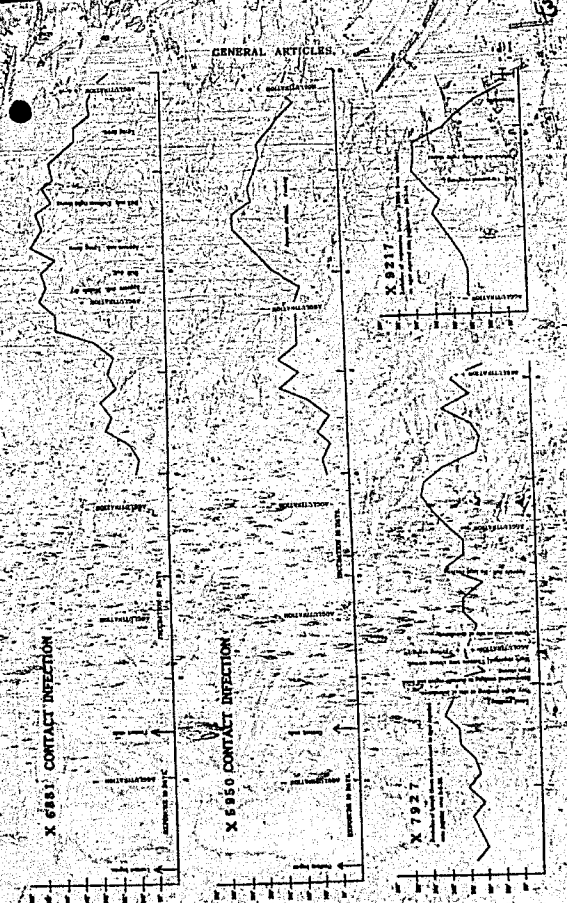
Two animals, Nos. X8082 and X8667, were inoculated in similar fashion with first generation culture from thoracic lymph obtained from a natural case of the disease. X8082 developed a local swelling at the site of inoculation, which persisted from the twelfth to the 21st day. Serum taken from X8082 on the 16th day gave a strongly positive reaction in the agglutination test, and a similar result was obtained with blood drawn on 27th, 40th, 48th and 65rd days. During ten weeks' observation this animal never showed any other reaction to the inoculation, but when destroyed on the 70th day it was found to have one sequestrum in the left lung. Histologically the lesion was diagnostic, but cultures could not be obtained.

The other animal, X8667, did not react in any way to the inoculation, and gave consistently negative reactions to the agglutination test up to the 70th day, when he was destroyed and found to have completely healthy lungs.

Infection with Culture from Shoulder Tumours.

Two separate attempts were made to infect animals with first generation cultures derived from shoulder tumours. In the first experiment X8123 and X8471 were inoculated with a culture recovered from X8234 during a reaction to subcutaneous inoculation with filtered "shoulder lymph." Neither of these animals reacted to the original inoculation and both reacted severely five months later to subcutaneous inoculation with thoracic lymph from a natural case.

X7685 and X8110 were similarly inoculated with the same culture from X8234. Neither reacted and both were negative when examined *post-mortem*. At the beginning of the experiment the sera from all four animals gave negative results to the agglutination test, but from the 77th day onwards all gave positive reactions, three of them very strong positives. It will be observed that in spite of these positive reactions X8123 and X8471 were not protected against a subcutaneous inoculation of virulent lymph, and X7535 and X8118 were not found to be infected when examined *post-mortem*.



In the second experiment three animals, Nos. X8019, X9201 and X9217, were inoculated intrajugularly with first generation culture recovered from a shoulder tumour in X9204 during a reaction to subcutaneous inoculation of thoracic lymph from a natural case.

The temperature of X9217 rose on the sixth day after inoculation and this animal developed an acute pleuro-pneumonia affecting chiefly the right lung, and leading to death on the 17th day after inoculation. *Post-mortem* there was rather more than an ounce of exudate in the right half of the thoracic cavity. The posterior two-thirds of the right lung was much enlarged with a thick fibrinous deposit on the visceral pleura. The whole of the affected portion of the lung was in varying stages of red hepatisation. The interlobular septa and peribronchial connective tissues were thickened and distended with lymph. The left lung contained

FIG. 2.

Cross section of affected portion of right lung of X9217. Acute fatal pleuro-pneumonia provoked by an embolus containing culture derived from a shoulder tumour.

four large lesions and eight small ones. The large lesions were not encapsuled and macroscopically they were typical of acute pleuro-pneumonia (Fig. 2). Histologically the lesions were equally diagnostic and a pure culture was recovered from the thoracic lymph.

X9201 also commenced to react from the sixth day, but clinically the reaction was not so severe, although extensive areas of dullness could be detected in the right lung and the animal coughed frequently. The animal lost condition but made a partial recovery from the attack. On the 27th day X9201 gave a markedly positive reaction to the agglutination test, and on the

32nd day, roughly twelve days after the acute reaction had subsided, X9201 was destroyed for examination. *Post-mortem*, the right lung was found to contain two large areas together roughly the volume of a cocoanut, which were evidently in process of encapsulation. In one of these lesions the tissue was breaking down to a brown grumous fluid. In the left lung there were four sequestra, the largest roughly the size of a cricket ball and the remainder about the size of a walnut. These sequestra were well separated from the surrounding normal tissue. Pure cultures of the organism were obtained from the softened lesion in the right lung both before and after filtration. Histologically these lesions were typical.

The remaining animal, X8019, never reacted to the inoculation, although from the fourth to the seventh weeks he gave strongly positive reactions to the agglutination test. He was destroyed on the 42nd day for examination and proved to be unaffected.

INFECTION BY CONTACT.

Seven cattle, Nos. X7878, 7807, 7795, 7009, 7819, 7911 and 7769, were put in contact in a large loose-box with three cattle chronically affected with pleuro-pneumonia. The exposure lasted ten-and-a-half months; and neither the naturally affected animals nor any of the in-contact animals showed any definite clinical reaction during this period, except that the naturally affected animals were occasionally observed to cough.

All the animals in the experiment were periodically tested by the agglutinin-precipitin test of Dahmen, and/or the ordinary tube agglutination test, using as antigen in the latter test a carbol-saline emulsion of the organism prepared by centrifuging a broth culture at 11,000 revolutions for 15 minutes and taking up the precipitate in carbol-saline.

Nos. X7878, 7807 and 7795 remained negative to these tests throughout the experiment and were eventually discharged. Nos. 7009 and 7819 remained negative throughout and were examined *post-mortem* with negative result. X7911 was at first negative to the blood tests, but gradually from giving doubtful results with occasional positives in the earlier months, became completely positive in the eighth month, and was destroyed. On *post-mortem* examination X7911 was found to have a small sequestrum in the left lung, roughly ½-in. in diameter. The sequestrum contained caseous material, and the surrounding tissue for about ½-in. in radius was congested and in parts hepatised with distended septa. Histologically the tissue changes surrounding the sequestrum were typical of the disease.

X7769, at first negative to blood tests, became strongly positive by the fifth month. This animal was destroyed after five-and-a-half months' contact. *Post-mortem* an adhesion was

found towards the lower border of the right lung and beneath it a sequestrum about 1½-in. in diameter containing brownish yellow material of the consistency of thick cream. The lung tissue for a radius of ½-in. to 2-in. around the sequestrum was congested and there was marked infiltration of the septa. This area was not completely hepatised, but histologically the picture was a typical one. Attempts to obtain cultures failed, and two cattle inoculated subcutaneously with ground up tissue also failed to react, though they were later proved to be susceptible.

In this experiment then, two animals out of seven exposed to infection by contact with chronic cases of pleuro-pneumonia became infected.

An attempt was next made to secure infection under more closely controlled conditions, and here it was fortunate that we were able to obtain acute cases of the disease as a source of infection. Five cattle, Nos. X7365, X6574, X6025, X6050 and X6881, were placed in contact with four acutely affected animals, obtained from Kajiado. The exposure lasted ten days, by which time all the naturally affected animals were dead.

Two of these animals, Nos. X7365 and X6574, remained negative to blood tests and clinically healthy for prolonged periods after the ten days' exposure, and each reacted severely to a subcutaneous inoculation of lymph nine months after the beginning of the experiment.

A third animal, X6,025, was never observed to react clinically but became positive to the agglutinin-precipitin and agglutination tests on the 19th day, and remained so until he was destroyed on the 106th day. The *post-mortem* examination gave a completely negative result.

X6050 gave a marked temperature reaction 30 days after the finish of the ten days' exposure. During this reaction, which lasted nine days, no lung changes could be detected by clinical examination. On the 29th day, *i.e.*, the day before the temperature reaction commenced, this animal's blood was negative to the agglutination and precipitin-agglutinin tests. Thirteen days later he gave a strongly positive result to both tests and his blood remained strongly positive up to the day of his death. He was destroyed on the 121st day and at *post-mortem* examination the left lung was found to be firmly adherent to the chest wall over an area approximately 12-in. × 9-in. in extent. In the cardiac lobe of the left lung there was a well isolated sequestrum roughly the size of a cricket ball. Macroscopically and microscopically the lesion was diagnostic, but attempts to obtain cultures from the lesion were unsuccessful.

X6881 reacted on the 27th day after the close of the period of contact. The temperature reaction lasted 17 days. Dullness could be detected over a large area of the right lung during the second week. On the 29th day, *i.e.*, two days after the commencement

of the reaction, the blood of X6881 was negative to the agglutination and precipitin-agglutinin tests, but on the 42nd day it was strongly positive and remained so until death. This animal was destroyed on the 130th day.

Post-mortem the thoracic cavity contained no fluid but there was an adhesion of the right lung to the chest wall, roughly 2-in. × 1-in. in extent. The visceral pleura of the right lung was markedly thickened, tough and opaque; while the parenchyma of the lung appeared normal, the lobules were widely separated by septa which were composed of loose areolar fibrous tissue partially organised. There was one small encapsuled sequestrum roughly the size of a haricot bean. The left lung was normal. The appearance of the right lung and pleura indicated that there had been resolution of an acute pleuro-pneumonia that had involved the whole organ.

DISCUSSION.

It has been possible for the first time to reproduce by inoculation of the organism, either in lymph or pure culture, the pathological condition regarded as characteristic of contagious bovine pleuro-pneumonia. Infections have been obtained once in many attempts by the intratracheal route, and five times in nine attempts by embolus production. The evidence in support of the general assumption of a causal relationship between the organism and the disease is now almost complete, lacking only a demonstration of the contagious character of the disease set up by inoculation. Unfortunately in these preliminary experiments none of the animals that have been kept in contact with the inoculated animals have contracted the disease. In view, however, of the experience already gained in the study of infection by contact, there is no reason to anticipate that the demonstration of contact infection from inoculated animals will offer any very great difficulty if the disease produced by inoculation is actually contagious bovine pleuro-pneumonia.

The technique devised by Tuttle for the production of emboli in the lungs is likely to prove of the greatest value in future investigation of the disease. The high proportion of infections already obtained by this technique suggests that it will be advantageous to use the method in investigations of the immunising power of different vaccines and the duration of immunity in vaccinated animals, in place of the more artificial method of subcutaneous inoculation.

Still more encouraging is the opportunity it will afford to investigate the persistence of infection in partially or clinically recovered animals, where the lesions are in process of sequestration. One of the greatest difficulties in the control of the disease by vaccination and segregation of in-contacts is to decide when a quarantine may safely be lifted; and, although there are occa-

sional records of the recovery of the organism from natural cases after prolonged periods (even up to two years), it has not previously been possible to obtain perfectly authenticated information on this point.

The most interesting feature of the infections obtained by contact is the length of the period of incubation after all contact has ceased. In the two animals for which data are available this period was 30 and 25 days, which is definitely longer than the period formerly allowed in Kenya as an incubation period, when control by the conglutination test was applied to animals exported from certain infected native reserves.

A number of serological tests has been devised to detect the "lunger" or apparently healthy but infected animal, but when these tests have been applied to the detection of carriers among animals exposed to infection the results have been largely disappointing.

Apart from general difficulties in the technique of the tests, which may be ascribed in great part to rapid changes in the virulence of the organism in serial culture, apparent failure to detect all the infected animals in an outbreak may in certain cases be explained by the length of the incubation period. Failures in the opposite sense, *i.e.*, the obtaining of repeated positive reactions from animals that are found *post-mortem* to be completely healthy, are equally explicable by the fact noted in this paper that an animal exposed to infection (either by contact or inoculation) may develop antibodies in the absence of recognisable lesions and even without acquiring any demonstrable immunity. Such an animal may be a strong reactor to any serological test. In a few cases it will be observed that animals have recovered from severe subcutaneous reactions to lymph or have completely resisted such inoculations and yet have afterwards failed to react to the usual serological tests. This, however, may not be a matter of very great importance in control of the actual disease.

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H. R. Grubb, Ltd., Printers, Poplar Walk, Croydon.