MEMORANDUM ON RESEARCH ON EAST AFRICAN SWINE FEVER IMMUNIZATION IN KENYA.

By J. WALKER, M.R.C.V.S., Chief Veterinary Research Officer, Department of Agriculture, Kenya.

The diagnosis of East African swine fever in Kenya (late British East Africa Protectorate) dates from June, 1910; up till December, 1915, fifteen naturally occurring outbreaks were reported in the Colony involving 1,366 pigs of which 98.9 per cent. succumbed to the disease.

Nineteen outbreaks are recorded in the Annual Reports of the Chief Veterinary Officer during the period 1915-1927. Montgomery was the first to study this disease and to attempt immunization and from 1910 to 1917 carried out research work hereon at the Veterinary Pathological Laboratory, Kabete, Kenya.

He established that the virus is filterable and found that the English and European anti-serum prepared against the swine fever of those countries did not protect against the East African virus; pigs immune to the English type succumbed when infected with the East African virus and the serum of a pig recovered from the latter disease did not protect against the English virus.

Serum prepared locally from the single available domestic pig which survived injection with the East African virus and from wild pig respectively, was found valueless even when employed in very large doses.

He attempted to obtain immune pigs by other methods, viz.:—

(a) Mixing "in vitro" the virus, with the sera of naturally refractory animals such as the horse, mule, donkey, sheep, and goat respectively.

(b) Attenuation of the virus by heat.

The former was found of no assistance, and although by the latter method one of a number of pigs recovered and was proved to be immune, heating was found unsatisfactory inasmuch as the virus when heated below the thermal death point either produced, in some animals, a lengthened incubation period and reaction and the animals died of secondary infection, or in others no reaction and no immunity was conferred.

Montgomery was thus confronted with the difficulty of obtaining immune and hyperimmune pigs.

For some time past the writer has endeavoured to immunize and hyperimmunize domestic pigs against the East African virus by various methods. The experiments carried out and results obtained are recorded in the Annual Reports of the Chief Veterinary Research Officer for the following years, viz., 1921, 1922, 1924, 1925, 1926, 1927 and which are embodied in the Annual Report of the Agricultural Department, Kenya, for those years. The experiments and results obtained during 1929 to date are also included in this memorandum.

Briefly it was found that—

(1) the serum of wart hogs which had been inoculated with the East African virus and the serum of wart hogs inoculated with comparatively large doses of East African virus, possessed no protective properties;
ON EAST AFRICAN SWINE FEVER IN KENYA.

Chief Veterinary Research Officer, Agriculture, Kenya.

Swine fever in Kenya (late British from June, 1910; up till December, 1919, outbreaks were reported in the which 98.9 per cent. succumbed to recorded in the Annual Reports of the period 1915-1927. Montgomery research and to attempt immunization and search work hereon at the Veterinary Kenya.

Virus is filterable and found that the person prepared against the swine fever the excess against the East African virus; succumbed when infected with the of a pig recovered from the latter English virus.

In the single available domestic pig the East African virus and from wild had disappeared even when employed in very pigs by other methods, viz.:—

1. The virus, with the sera of naturally such as the horse, mule, donkey, sheep, pigs by heat.
2. No assistance, and although by the use of pigs recovered and was proved to unsatisfactory inasmuch as the virus death point either produced, in some period and reaction and the animals in others no reaction and no immunity were obtained.

Satisfactory results in the difficulty of obtaining fer has endeavoured to immunize and against the East African virus by its carried out and results obtained from the Chief Veterinary Research 1921, 1922, 1924, 1925, 1926, in the Annual Report of the Agriculture those years. The experiments and data are also included in this memo-

which had been inoculated with the and the serum of wart hogs inoculated at large doses of East African virus, properties;

(2) the prescribed and increased doses of American anti-swine fever (hog cholera) serum did not protect;
(3) pigs which had recovered from simultaneous inoculation of the American swine fever (hog cholera) serum were not protected against the East African virus;
(4) treatment of virulent blood with Lugol’s solution for varying periods and at varying concentrations, either rendered the virus inert in which case no reaction occurred and no immunity was conferred, or the virus was attenuated and when inoculated produced, in some pigs, a reaction after a lengthened incubation period, ending in the death of the animal or, in others, either a slight or no reaction and no immunity. Variations in susceptibility of individual pigs was found to be one of the difficulties in the standardising of an attenuated virus;
(5) treatment of virulent blood with trypanblue solution and sodium potass. bismuth tartrate was of no assistance. The virulence was not affected by these;
(6) passage of virulent blood through naturally refractory animals, e.g., the horse, cattle, rabbit, and guinea pig, was unsatisfactory. Blood collected from these after they had been inoculated with virulent blood did not transmit the disease to susceptible domestic pigs and no immunity was conferred.

So far attempts to hyperimmunize domestic pigs had failed; the few which reacted and recovered, when subsequently inoculated with a comparatively large dose of virulent blood with a view to hyper-immunization, died of swine fever and immunization by other methods was resorted to, viz.:—

1. Immunization with an attenuated virus.
2. Prophylactic vaccination with tissue extract.

IMMUNIZATION WITH AN ATTENUATED VIRUS.

The most promising results were obtained with virus ex domestic pig No. 1,125; the history of this animal is as follows, viz.:—

Pig No. 1,125 was injected subcutaneously on 11/5/25 with 2 c.c. blood in O.C.G., equal parts, of domestic pig No. 1,095.

Result.—A temperature reaction commenced on 14/5/25 which continued until 18/5/25, maximum 104.4° Fahn., animal was visibly sick during the reaction. (Blood was collected from 1,125 in equal parts of O.C.G. on 18/5/25 and stored in the ice-chest at a temperature of approximately 48° Fahn.).

Note.—Pig No. 1,095 was injected on 21/2/25 with virus, collected at the time of an outbreak of the disease in the Naivasha area, and died on 28/2/25 of swine fever.

Pig 1,125 was tested on its immunity on the following dates with the following results:—

28/5/25 with 1 c.c. blood of pig 1,095 (for history of virus see above).

Result.—No temperature reaction or clinical symptoms.
15/7/25 with 10 c.c. blood ex pig 1,091.

263
Result.—A temperature reaction from 17/7/25 to 24/7/25, maximum 105° Fahr., ending in recovery. No clinical symptoms noted.

Note.—1,091 reacted to virus ex 1,035 and died of swine fever, 7/8/25 with 20 c.c. blood, in equal parts of citrate solution, ex pig 1,113.

Result.—No temperature reaction and no clinical symptoms.

Note.—pig 1,113 gave a protracted temperature reaction, viz., from 5/8/25 to 20/8/25 to subcutaneous injection of 1 c.c. blood in O.C.G. solution ex pig 1,125 of 18/5/25 and died of swine fever on 20/8/25.

Note.—Blood of 1,125 was collected on 17/8/25 and proved virulent.

Blood of 1,125 was collected on 20/8/25 and proved non-virulent. 29/9/25, with 60 c.c. of a mixture of equal parts of blood and citrate solution, ex pig 1,121 of 28/9/25.

Result.—On the 19th day after inoculation, viz., 18/10/25, a temperature reaction commenced to swine fever lasting till death on 25/10/25, maximum 107.2° Fahr. 23/10/25.

Note.—pig 1,121 was inoculated on 26/8/25 with 2 c.c. fresh blood of pig 1,125 and did not react, but subsequently contracted swine fever by contact from a pig reacting to the same strain of virus.

SUMMARY.

Pig 1,125 reacted and recovered to an original injection of virulent blood, and when tested on its immunity with the same virus did not react; when re-inoculated with 10 c.c. blood of the same strain of virus, after passage through a susceptible pig, it reacted and recovered. On subsequent re-inoculation with 10 c.c. blood, of the same strain of virus after passage through another susceptible pig no reaction occurred, but on re-inoculation with 30 c.c. of blood of the same strain of virus after passage through another susceptible pig, a reaction occurred, commencing on the 19th day and ending in death from swine fever on the 26th day.

Blood of pig 1,121 was collected in equal parts of O.C.G., on 18/5/25, and utilized on various dates between 18/5/25 and 22/2/26 for the inoculation of susceptible pigs destined for anti-swine-fever serum production, with the following results:

SUMMARY OF RESULTS.

Reacted and recovered but died of other causes ...................... 2 = 4.6 %
Reacted and died of swine fever ............................................ 13 = 30.2 %
Reacted and recovered but died of swine fever when tested on their immunity ......................................................... 4 = 9.5 %
Indefinite reaction and recovered and when tested on their immunity died of swine fever .................................................. 10 = 23.2 %
Reacted but not tested on their immunity ................................. 5 = 11.6 %
No reaction, died of swine fever when tested on their immunity ................................................................. 9 = 20.9 %

Total ................................................................. 43

The results obtained show—

(1) that blood collected from a pig which reacted and died of a naturally infected strain results, as regt susceptible pigs;

(2) pigs which reacted and 1 on their immunity with due to the same strain of virus, with pigs reacting to the same and died of swine fever.

(3) pigs which reacted and recovered to re-inoculation after passage, again reacting with virus of the same strain a pig reacting to the same strain.

Further work in this direction with the same strain of virus passed it with 5 c.c. of blood of pig 1,125 on.

Result.—A temperature reaction continued till the 26th day when maxima was tested on its immunity on the 26th day. Animal died on the 3/6/26 of swine fever, O.C.G. mixture on the 19/4/26 and 1/9/26.

Note.—pig 1,113 was inoculated on 28/7/25 and died of swine fever.

Blood of pig 789 collected on 3/1/26 inoculated to the following pigs on 3/1/26.

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Result</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1204</td>
<td>7/2/29</td>
<td>Died of Swine Fever</td>
<td></td>
</tr>
<tr>
<td>1205</td>
<td>14/2/29</td>
<td>Reacted and recovered</td>
<td></td>
</tr>
<tr>
<td>1210</td>
<td>11/3/29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1217</td>
<td>31/3/29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ion from 17/7/25 to 24/7/25, maximum. No clinical symptoms noted.

sex 1,035 and died of swine fever,
mal parts of citrate solution, ex pig
ction and no clinical symptoms.
ducted temperature reaction, viz.,
taneous injection of 1 c.c. blood in
8/25 and died of swine fever on
ected on 17/8/25 and proved
on 26/8/25 and proved non-virulent.
mixture of equal parts of blood and
8/9/25.
fter inoculation, viz., 18/10/25, a
 to swine fever lasting till death on
9/10/25.
dated on 26/8/25 with 2 c.c. fresh
react, but subsequently contracted
reacting to the same strain of virus.

MARY.
overed to an original injection of
its immunity with the same virus
ad with 10 c.c. blood of the same
uch a susceptible pig; it reacted and
ulation with 10 c.c. blood, of the
 through another susceptible pig no-
ulation with 30 c.c. of blood of the
 through another susceptible pig.
ng on the 19th day and ending in
th day.
ected in equal parts of O.C.G., on
dates between 18/5/25 and 22/2/26
pigs destined for anti-swine-fever
wing results:

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Result</th>
<th>Immunity Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Date</td>
<td>Inoculated with</td>
</tr>
<tr>
<td>1204</td>
<td>7/2/29</td>
<td>Died of Swine Fever</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1205</td>
<td>14/2/29</td>
<td>Reacted and recovered</td>
<td>1/5/29</td>
<td>Blood or 1213 of 27/3/29</td>
</tr>
<tr>
<td>1210</td>
<td>11/3/29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1217</td>
<td>31/3/29</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The results obtained show—

1. that blood collected during the reaction from a domestic pig which reacted and recovered to the injection of blood of a naturally infected pig, after passage, produces inconsistent results, as regards reactions and mortality, in susceptible pigs;

2. pigs which reacted and recovered, when subsequently tested on their immunity with blood of another pig which reacted to the same strain of virus or which were put in contact with pigs reacting to the same strain of virus again reacted and died of swine fever;

3. pigs which reacted and recovered and again reacted and recovered to re-inoculation with the same strain of virus, after passage, again reacted and died, when re-inoculated with virus of the same strain or when put in contact with a pig reacting to the same strain of virus.

Further work in this direction was continued in 1928 and 1929 with the same strain of virus passed through domestic pig No. 789.

The history of 789 is as follows, viz., inoculated on the 22/2/26 with 5 c.c. of blood of pig 1,125 of the 18/5/25 diluted 1/10 saline.

Result.—A temperature reaction commenced on the 13th day and continued till the 26th day, maximum 105.4° Fah., 22nd day. 789 was tested on its immunity on the 14/4/29 with 5 c.c. blood diluted 1/20 in saline ex pig 1,113 collected on the 7/8/25.

Result.—Temperature reaction commenced on the 16/4/26. Animal died on the 3/6/26 of swine fever. (Blood was collected in O.C.G. mixture on the 19/4/26 and stored.)

Note.—Pig 1,113 was inoculated with 1 c.c. blood of Pig 1,125 on the 28/7/26 and died of swine fever on the 21/8/25.

Blood of pig 789 collected on the 19/4/26 in O.C.G. mixture was inoculated to the following pigs on the following dates:

TOTAL 43
<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Blood or 1213 of 25/2/29</th>
<th>Result</th>
<th>Histological examination</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1012</td>
<td>12/3/29</td>
<td>Blood</td>
<td>No reaction</td>
<td>Blood or 1213 of 25/2/29</td>
<td>12/3/29</td>
</tr>
<tr>
<td>1013</td>
<td>27/3/29</td>
<td>Blood</td>
<td>No reaction</td>
<td>Blood or 1213 of 25/2/29</td>
<td>27/3/29</td>
</tr>
<tr>
<td>1016</td>
<td>31/3/29</td>
<td>Blood</td>
<td>No reaction</td>
<td>Blood or 1213 of 25/2/29</td>
<td>31/3/29</td>
</tr>
<tr>
<td>1219</td>
<td>2/4/29</td>
<td>Blood</td>
<td>No reaction</td>
<td>Blood or 1213 of 25/2/29</td>
<td>2/4/29</td>
</tr>
<tr>
<td>1215</td>
<td>2/6/29</td>
<td>Blood</td>
<td>No reaction</td>
<td>Blood or 1213 of 25/2/29</td>
<td>2/6/29</td>
</tr>
</tbody>
</table>

**SUMMARY**

Seventy-five per cent. of the pigs (strain 1,126) stored in the ice-box for approximately 34 months, when tested on their immunity were collected 33 days previous, were reactors.

Eighty-five per cent., approximate passage virus (strain 1,125) immeasurable 32 days after collection, died of some 330, *extremitis* for collection of virus or infection.

**PROPHYLACTIC VACCINATION**

Experimental prophylactic vaccine was commenced in 1927. The spleen or thymus, mixed with saline after mincing, was formalinized.

The following is a summary of the results:

1. 1 in 1,000 formalin spleen extract and then centrifuged, and the suspension injected into swine produced a fever and death from swine fever.

2. 1 in 100 tolulose spleen extract stored for 3 days at 0°C., produced a reaction and swine fever.

3. 1 in 100 tolulose spleen extract and normal saline in the proportion of 1:100 further lot of tolulose added to make 20 per cent. of the extract stored at 0°C. produced a reaction and swine fever.

4. Extract to which tolulose was added and the extract incubated at 0°C. produced an irregular reaction and not protect against a subsequent subcutaneous injection of blood extract 1,059 of 16/11/25 (attenuated).

5. Extracts of 20/9/27 in normal saline 10 per cent. to which tolulose 9.9 per cent. was added, then incubated for 10 days, produced a temperature reaction in 10 per cent. of 0.1 c.c. extracts, and simultaneously 0.1 c.c. extract, an irregular reaction occurred, maximum 102.6°F. F., when injected into its immunity with virus, 1,184 c.c. of blood and death from swine fever resulted.

Inoculation of extract prepared by virus 1059 of 16/11/25, produced a reaction in susceptible animal, virulent for pig, which died of sub-peritoneal abscessation but no immunity was conferred on swine.
SUMMARY.

Seventy-five per cent. of the pigs inoculated with passage virus (strain 1,125) stored in the ice-box at 4-10° Cent. or at room temperature for approximately 34 months, reacted and survived; and when tested on their immunity with passage virus (strain 1,125) collected 35 days previously, were resistant. Four in experiment.

Eighty-five per cent., approximately, of the pigs inoculated with passage virus (strain 1,125) immediately after collection, or up to 32 days after collection, died of swine fever or were destroyed in extremis for collection of virus or material. Seven in experiment.

Prophylactic Vaccination with Tissue Extract.

Experimental prophylactic vaccination with tissue extract was commenced in 1927. The spleen of reacting pigs was collected and mixed with saline after mincing, and then treated with toluol, or formalin.

The following is a summary of the results obtained:

1. 1 in 1,000 formalin spleen extract stored at 0° C. for 7 days, and then centrifuged, and the supernatant fluid inoculated, produced swine fever and death from swine fever.

2. 1 in 100 toluol spleen extract incubated for 48 hours and stored for 3 days at 0° C., produced swine fever and death from swine fever.

3. 1 in 100 toluol spleen extract incubated at 35° C. for 4 days and normal saline in the proportion of 1 of spleen to 9 of saline; a further lot of toluol added to make 1 per cent. of the total bulk, and the extract stored at 0° C. produced swine fever and death from swine fever.

4. Extract to which toluol to make 3 per cent. of the total bulk was added and the extract incubated for 48 hours at 35° C. and stored at 0° C. produced an irregular temperature reaction, but did not protect against a subsequent subcutaneous inoculation of 1 c.c. blood ex 1,098 of 16/11/25 (attenuated virus).

5. Extracts of 20/9/27 in normal saline, 1 per cent. spleen to 9 per cent. saline, to which toluol to make 3 per cent. of the total bulk was added, then incubated for 48 hours and stored at 0° C. produced a temperature reaction in a susceptible pig, 1,180; when re-inoculated with virus, 1,098 of 16/11/25 (attenuated virus) and simultaneously 10 c.c. extract, an irregular temperature reaction occurred, maximum 102.6° Fahr., when 1,180 was subsequently tested on its immunity with virus, 1,184 of 26/11/27, a reaction to swine fever and death from swine fever resulted.

Inoculation of extract prepared by Method 5, and simultaneously virus 1059 of 16/11/25, produced a temperature reaction in one susceptible animal, viz., 1,179 (blood collected from 1,179, and inoculated to a susceptible pig, 1,183 produced a mild temperature reaction, but no immunity was conferred in 1,183 against virus 1,184 of 26/11/27).
The remaining pig inoculated with virus 1,059 of 16/11/25, and simultaneously extract prepared by Method 5, gave an irregular temperature reaction, but no immunity was conferred to virus 1,184 of 12/11/27.

Two inoculations with extract, prepared by Method 5, at an interval of 12 days, and a third inoculation 10 days later with the extract and simultaneously attenuated virus 1,059 of 16/11/25, produced no reaction; and immunity was not conferred against virus 1,184 of 26/11/27.

Inoculation of extract prepared by Method 5, did not protect against virus 1,184 of 26/11/27, simultaneously inoculated.

(6) Inoculation of spleen extract in normal saline, 1 of spleen to 9 of saline, to which toluol to make 3 per cent. of the total bulk was added, and the extract then incubated for 48 hours at 35° C. produced a temperature reaction in 1,183 from the 3rd day. Animal died of swine fever on the 7th day.

Note.—1,183 was inoculated on 12/11/27 with blood of 1,179, (see above). On post-mortem examination, 1,183 showed only chronic swine fever bowel lesions probably result of the reaction from the original inoculation.

Prophylactic vaccination was continued during 1928 and 1929.

Details are given in the tabulated sheet.
<table>
<thead>
<tr>
<th>Tissue Used</th>
<th>Method of Treatment of Tissue</th>
<th>No. of Pig</th>
<th>Date</th>
<th>Dose</th>
<th>Result</th>
<th>Immunity Test</th>
<th>Result</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spleen, liver and kidney ex pig 1181</td>
<td>Mixed, 28/3/28, and mixed with normal saline 1 gramme to 1 c.c. Chilorform added to make 3% of the total bulk</td>
<td>1181</td>
<td>19/12/28</td>
<td>15 c.c.</td>
<td>No reaction</td>
<td>7/2/29</td>
<td>Put in contact with reacting pigs</td>
<td>Died of Swine Fever, 1/2/29</td>
</tr>
<tr>
<td>Spleen ex pig 1181</td>
<td>Mixed, 13/3/29, and mixed with saline 1 gramme to 1 c.c. Techeol added to make 3% of the total bulk. The mixture then incubated for 48 hours and thenreated in 24 hours</td>
<td>1215</td>
<td>19/3/29</td>
<td>10 c.c.</td>
<td>Reacted &amp; recovered</td>
<td>1/5/29</td>
<td>1 c.c. of blood of 1211 of 31/3/29</td>
<td>No reaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1214</td>
<td>8/4/29</td>
<td>10 c.c.</td>
<td>No reaction</td>
<td>28/4/29</td>
<td>Put in contact with reacting pigs</td>
<td>Reacted from the 11th day of contact and died of Swine Fever on 7/5/29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1222</td>
<td>6/4/29</td>
<td>15 c.c.</td>
<td>30/4/29</td>
<td>1 c.c. of blood of 1213 of the 31/3/29</td>
<td>Reacted.</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1225</td>
<td>16/4/29</td>
<td>15 c.c.</td>
<td>10/5/29</td>
<td>1 c.c. of blood of 1213 of the 31/3/29</td>
<td>Reacted and died of Swine Fever, 21/5/29</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1224</td>
<td>22/4/29</td>
<td>15 c.c.</td>
<td>16/5/29</td>
<td>1 c.c. of blood of 1213 of the 31/3/29</td>
<td>Reacted and died of Swine Fever, 22/5/29</td>
<td>—</td>
</tr>
</tbody>
</table>
1. Tissue (spleen, liver, and saline in the proportion of 1 gram added to make 3 per cent. of the stored for 5 days in the ice-chest inoculations of the above-treated gave no definite reaction to the vac death; three inoculations protecte vaccination, against a severe reaction. Two in experiment.

2. Spleen pulped and mixed with saline) and toluol added to make 3 treated tissue incubated for 48 hours produced swine fever when inocul respectively after the date of prepa recovered and when tested on the were protected.

The same lot of treated spleen swine fever or confer immunity.

3. Pulped liver and spleen mixed with saline (1 in 500 of the mixture) produced swine fever; animal immunity with virulent blood reac

4. Pulped liver and spleen mixed with saline (1 in 100 of the mixture and stored twelve days at approximately 4°C in experiment. All recovered and immunity with a dose of virulent bl

**Conclu**

1. Virulent blood collected becomes, after a period of storage, infectible pigs a definite reaction. A with attenuated virus recover and strain of virus recently passed thro

2. Virulent blood attenuated by passage through susceptible pig of mortality.

3. Attenuation of the virus is (spleen, liver, or kidneys) collected chloroform, or formalin; susceptible inactivated extract, but in which recover. Some of the survivors inoculation with virulent blood; other reaction and survive; in others na severe reaction and death.
271

SUMMARY.

1. Tissue (spleen, liver, and kidney) pulped and mixed with saline in the proportion of 1 gramme to 1 c.c. saline and chloroform added to make 3 per cent. of the total bulk and the treated tissue stored for 85 days in the ice-chest at approximately 40° Cent. Two inoculations of the above-treated tissues did not protect a pig, which gave no definite reaction to the vaccine, against contact infection and death; three inoculations protected a pig, which reacted slightly to vaccination, against a severe reaction and death from contact infection. Two in experiment.

2. Spleen pulped and mixed with saline (1 gramme to 1 c.c. of saline) and toluol added to make 3 per cent. of the total bulk and the treated tissue incubated for 48 hours and then stored in the ice-chest produced swine fever when inoculated on the 6th and 18th days respectively after the date of preparation. Two in experiment. Both recovered and when tested on their immunity with virulent blood, were protected.

The same lot of treated spleen stored for 24 days did not set up swine fever or confer immunity. Four in experiment.

3. Pulped liver and spleen (mixed) ex pig 1,219 and mixed with saline, 1 gramme to 4 c.c. of saline and commercial formalin, added to make 1 in 500 of the mixture and stored in the ice-chest at approximately 40° Cent. and inoculated five days after preparation produced swine fever; animal when subsequently tested on its immunity with virulent blood reacted severely. One in experiment.

4. Pulped liver and spleen of the same pig, viz., No. 1,219, mixed with saline (1 in 4) and commercial formalin added to make 1 in 100 of the mixture and stored in the ice-chest for approximately twelve days at approximately 40° Cent. produced swine fever. Three in experiment. All recovered and when subsequently tested on their immunity with a dose of virulent blood reacted severely.

CONCLUSIONS.

(1) Virulent blood collected in equal parts of O.C.G. mixture becomes, after a period of storage, attenuated and produces in susceptible pigs a definite reaction. A large percentage of pigs inoculated with attenuated virus recover and survive inoculation with the same strain of virus recently passed through a susceptible pig.

(2) Virulent blood attenuated by storage increases in virulence by passage through susceptible pigs and produces a high percentage of mortality.

(3) Attenuation of the virus is also possible by treating tissues (spleen, liver, or kidneys) collected from a reacting pig, with toluol, chloroform, or formalin; susceptible pigs inoculated with non-inactivated extract, but in which virus is attenuated, react and recover. Some of the survivors are completely protected against inoculation with virulent blood; others are protected against a severe reaction and survive; in others no protection is conferred against a severe reaction and death.
(4) Inactivated extract confers little or no protection. The strain of virus used for testing the pigs on their immunity after treatment with inactivated extract would appear to be responsible for the small percentage which survive an immunity test with virulent blood.

As a result of the experimental immunization work, a number of recovered pigs are now available for hyperimmunizing with a view to the production of an anti-serum, and work in this direction is being continued.

Paper No. 33.

RABIES IN SOUTH AFRICA.

By P. J. du Toit, B.A., Ph.D., Dr. Med. Vet., Director of Veterinary Services and Animal Industry, Department of Agriculture, Union of South Africa.

For many years the Union of South Africa has been considered free of rabies.

1. PORT ELIZABETH OUTBREAK, 1893.

The last authentic outbreak to occur was at Port Elizabeth in 1893. The disease had been introduced into the country with an Airedale terrier which was landed at Port Elizabeth in September, 1892. This dog took ill soon after arrival and exhibited symptoms which were very suspicious of rabies: "he first became unaccountably savage, attacked and fought with every dog he met, and barked and howled incessantly for a day or two before he died." The next case was observed in January, 1893, and this was followed by numerous cases until the disease was diagnosed by the local Government Veterinary Officer Britton in April, 1893.

The diagnosis was confirmed by sub inoculation into rabbits by Edington and Hutcheon at the Laboratory in Grahamstown.

Steps were immediately taken to deal with the outbreak. A Rabies Act was passed by Parliament and regulations were issued which prescribed the measures to be enforced. In Port Elizabeth all dogs had to be muzzled and tied up. Stray dogs were to be destroyed; and in less than a year about 2,000 had been dealt with in this way.

The disease also spread to the surrounding districts of Uitenhage, Jansenville, Willowmore and Albany, and in these areas also large numbers of ownerless dogs were destroyed.

The measures adopted were entirely successful and a year after the first outbreak the disease had disappeared completely. No mention is made of rabies in the subsequent annual reports of the Colonial Veterinary Surgeon, and at no time since 1893 has the disease again made its appearance in dogs in the Union of South Africa.

Before leaving this outbreak the following significant statement which occurs in the Annual Report for the year 1893 of Colonial Veterinary Surgeon, Dr. Hutcheon, may be quoted: "I was in great dread at one time when the disease was far distant from Port, but our wild animal the exception of the cattle which disease near Van Stadens, we have except dogs and cats that have been

2. RABIES IN SOUTHERN RHODESIA.

In Southern Rhodesia a case in August, 1902, in the neighbour spread rapidly and preventive measures were taken. In about 6 months nearly 40,000 dogs were treated for the year 1902/1903 in Southern Rhodesia. The author of the report states: "The disease has not been reported amongst cattle and the possibility that the disease may be stamened."

The following year the death of the cattle increased again very considerably, and the disease was again reported in small numbers.

The disease then fluctuated for 1904 and 1905. The disease increased again very considerably, and the disease was again reported in small numbers. Another marked reduction in the numbers of infected animals occurred in 1912, but the disease remained in small numbers. In 1914, the disease was again reported in small numbers. The disease has not been reported amongst cattle and the possibility that the disease may be stamened."

One incident which is mentioned in the report for the year 1906 is: "A most extraordinary case occurred in this district. On going outside one night, a farmer was aware of his dog. On going outside he saw the dog in the farmyard, and after being tied up, unfortunately escaped. The animal showed symptoms of dumb rabies and was killed."

From these accounts it would appear that the Union of South Africa has been free of rabies for the last 15 years, but there have been occasional outbreaks.

In both outbreaks described in the Annual Report for the year 1902-1913 there was a complete disappearance of the disease. The fear was expressed that wild fauna (carnivores), and so be the disease in the country.

Recent events have tended to confirm this view.