
Histological Studies on East Coast Fever.

**By WERNER STECK, Dr.Med.Vet. (Berne), Research Officer,
Onderstepoort.**

Histological Studies on East Coast Fever.

By WERNER STECK, Dr.Med.Vet. (Berne), Research Officer,
Onderstepoort.

	PAGE.
I. Introduction	243
II. Changes in various Organs.. .. .	244
III. Changes in the Blood	249
IV. Summary and Discussion	251-252
V. Appendix	268
(a) Results of the Blood Studies (Tables 2-14)	253-267
(b) Graphs showing the changes in the histology of the blood during the disease (Graphs 1-9)	288-292
(c) Post mortem findings in the experimental cases.. .. .	268
VI. References	280

I.—INTRODUCTION.

SPORADIC observations in the course of routine work seemed to contradict the present views as to the nature of the main alterations which occur in East Coast fever.

On the advice of Sir Arnold Theiler, I therefore began systematic studies, with the intention to elucidate those points which appeared particularly doubtful:—

- (1) The nature and the pathogenesis of the white foci in the kidneys.
- (2) The distribution of the lesions in the various organs.
- (3) The ultimate fate of the large foci in recovery.
- (4) The morphological changes in the blood.

The experimental cases produced in the course of the present investigation invariably took such a rapid course that there was little chance for the development of late lesions in the various organs. For this reason points 2 and 3 had to be dropped from the programme.

For the reader who may not be sufficiently acquainted with tropical diseases a short account of the general and clinical aspect of the disease may be given here. For further reference Knuth and Du Toit's "Tropenkrankheiten der Haustiere" (1) should be consulted.

East Coast fever as well as closely related diseases occur in many tropical and sub-tropical parts of Africa in bovines.

It is caused by a protozoon belonging to the Piroplasms, family Theileridae: *Theileria parva*. This is transmitted by ticks acting as intermediary hosts. When cattle are infested with infected ticks, small unicellular forms, the agamonts appear in the lymphoid tissue, free or inside lymphocytes, and by nuclear division grow out into large polynuclear bodies. (The polynuclear forms are commonly called Koch's bodies.) These break up into uninuclear cells. The

latter may as agametes repeat the cycle. Some of them, however, start the sexual cycle by developing into the small unicellular gametocytes. This stage is found in the erythrocytes. The gametocytes cannot develop further in the mammalian body. Only after their transfer into the tick will they become macro- and microgametes. There also copulation takes place, and from the fertilized macrogamete the spores develop which divide into sporozoites. These will infect cattle when they are inoculated with the bite of the tick.

The preference of the parasites for the lymphoid tissue is reflected in the clinical as well as the anatomical picture. After an incubation period of about thirteen days a fever develops which has a remittent, in some cases even an intermittent character. The most striking sign is the enlargement of the lymph glands. At the same time we observe lacrimation, catarrhal rhinitis, and very soon a marked loss of condition. Very marked emaciation is a characteristic sign in protracted cases.

The mortality generally exceeds 90 per cent. Death supervenes after a few days or only after weeks.

The anatomical picture is as has been said already mainly determined by the changes of the lymphoid tissue. The lymph glands are more or less markedly enlarged. But in the other organs the lymphoid tissue is also similarly affected. In the spleen the malpighian bodies are enlarged. In the liver which appears swollen, the periportal spaces may be very prominent on account of an accumulation of lymphoid cells which give them a greyish appearance. In the protracted cases the kidneys show very characteristic changes. In the cortex we see greyish semi-transparent foci which often are raised above the surface of the kidney for fractions of a mm. On section they appear irregular, roundish, sometimes conical. The cortex in the neighbourhood may show haemorrhages, and so complete a superficial resemblance with infarcts.

In many acute cases these white foci as well as the macroscopical foci in the kidneys are absent.

Ulcers in the stomach and intestines may develop, apparently on a basis similar to the lymphocytic foci in other organs.

II. CHANGES IN VARIOUS ORGANS.

The material used in the present investigation consisted of:—

1. Twelve kidneys showing good macroscopical lesions collected at various times at this laboratory and preserved in Kaiserlings fluid.
2. Organs collected at post-mortem examination of recent experimental cases.

Methods.—The post-mortem material was fixed in formaline, Zenkers fluid or sublimate alcohol. From all specimens paraffin and freezing sections are examined, stained with aniline-blue Haemalum-Eosin, Haemalum-Van Gieson, ferrocyanide of potassium for iron (prussian blue reaction), Helly's modification of the Giemsa stain, Mallory's aniline-blue stain for fine collagen fibrils, Pappenheim's methylgreen-pyronin, Altmann-Schridde stain in the modification of Kiyono, Graef-Van Gierke-Schultze's modification of the oxydase reaction, Bielschowsky-Maresch stain for fine collagen fibrils, intravitalstain with a 5 per cent. solution of carmine in saturated solution of lithioncarmine.

The Lesions in the Kidney.

The macroscopical picture of the renal lesions has often been described. Alterations striking the naked eye are present mainly in protracted cases, and in those they represent the most characteristic of all organ lesions in this disease. The surface of the kidney shows elevations up to 1 cm. in diameter, hemispherical and smooth, of a light often grey colour, unless they are infiltrated with blood in the centre or periphery. On section these foci are seen to enter the cortex and extend for a varying distance, sometimes right down to the medullary portion. They have a rubberlike consistence.

It was one of the main objects of my studies to elucidate the nature of these peculiar lesions.

Gray and Robertson (2) as well as Koch (3) had spoken of infarcts, apparently misled by the macroscopical appearance. This diagnosis was opposed by Collaud (4) who carried out histological studies on material obtained from this laboratory (1906). He came to the conclusion that the changes were of an inflammatory nature. In the development of his "nephritis haemorrhagica" he distinguishes the following stages:—

- (1) Stage of swelling of the epithelium.
- (2) Stage of multiple haemorrhages (per diapedesin).
- (3) Stage of cellular infiltration.
- (4) Stage of new formation of connective tissue.

In the first stage all the epithelial elements show degenerative changes which we could now designate as cloudy swelling. Perhaps he overestimated the changes in the epithelium. Quite aside from the possible autolytic changes which—as is well known—appear so soon in this organ, granular material can be found in the lumina of the tubuli and capsules of Bowman even in small specimens taken from healthy animals and fixed in formaline within a minute after death.

In the third stage he finds swelling of the vessel-walls, mainly affecting the intima.

Martin Mayer (5) on a limited amount of material confirmed Collauds views. On a considerably larger material K. F. Meyer (6), carried out histological studies.

With regard to the lesions in the kidneys as well as the liver and the lungs, he always found (6, 7) swelling of the intima-cells in the capillaries of the interstitium. As a sequel a small haemorrhage per diapedesin was observed. Koch bodies are washed in these lesions and an accelerating growth of the parasites takes place. Such a focus grows larger and resembles more or less a lymphoma or the metastasis of a growth.

Later, dealing with the histology of East Coast fever in Kolle-Wassermans handbook, the same author states:—The white foci in the kidneys are accumulations of larger lymphocytes in the neighbourhood of a bloodvessel, which push aside the renal tissue and progress in between the glomeruli and tubuli. They consist of mononuclear leucocytes, partly of epitheloid-cell-like elements, fibroblasts, and small lymphocytes. Polymorphonuclear leucocytes are very rare. These foci show the picture of an interstitial nephritis with new formation of the stroma (Stuetzgewebe).

In spite of this declaration in favour of the inflammatory nature of these white foci he seems not to have abandoned entirely the idea

of their lymphomatous nature. Dealing with the pathogenesis he says that the parasites damage the endothelial cells and perivascular lymph-follicles of all organs. New formations resembling lymphomata arise in the kidneys, liver, etc., to serve the proliferation of the parasites.

Carpano (9) speaks of haemorrhagic infarcts and of interstitial cellular infiltration in the more protracted cases.

In Joest's special pathological anatomy Henschen (10) refers to the lesions under the heading of interstitial nephritis, and bases his description mainly on the studies of Collaud.

In our investigations we were struck first by the fact that the size of the foci varies considerably or with other words that *between small perivascular round cell-infiltrations and large foci of many mm. diameter there does not seem to be a difference in structure*. In kidneys where foci involving the cortex over a considerable area give the organ a peculiar macroscopical appearance, microscopical examination reveals the presence not only of these, but of a series of foci of various dimensions. And the smaller foci are present in my experimental cases of an acute nature.

These smaller foci are of great value for the study of the lesions.

Particular attention has been paid to the localization. A careful study of several specimens by means of serial sections showed that all the foci were situated in the cortex either around a small artery (art. interlobularis, less frequently arteria arcuata), or in the immediate neighbourhood of a glomerulus. In the latter case often the side where the artery enters the glomerulus was the centre of the cellular infiltration.

Describing the structure of the focus we will disregard first the changes in the autochthonic elements, such as blood-cells, epithelial cells. The cells constituting the focus can then easily be brought into two groups:—

- (a) Infiltrating i.e. free round cells.
- (b) Sessile cells forming a reticulum.

The round cells are from 1.2 to 2.3 times as wide as the average red cell. They possess round trachychromatic nuclei and more or less marked basophile cytoplasm, which gives no oxydase reaction. The nucleus sits eccentrically in most of them and the plasma on the free side generally contains one or more polynuclear forms of *Theileria parva*. Very many of the cells are infected, in general more than half of them, often practically everyone.

A fair number of these cells show the nucleus in mitosis. These dividing cells are also infected.

The cells of the reticulum are large, the dimensions are those of the reticulum cells in lymph-follicles. They contain large oval or almost spherical, but sometimes slightly irregular nuclei. These are leptochromatic. Occasionally they are very large and lobated, in size and shape resembling those of megakaryocytes.

It is not rare to find the chromatin arranged peripherally in form of deeply stained regular threads. Spindles and asters, however, I have never seen.

The reticulum is intimately connected with the adventitia of the small arteries (see Figs. 5, 6, 7, 8, 9, 11) and goes over into that so gradually that it cannot be separated from it. It is difficult to free this reticulum from the infiltrating lymphocytes by mechanical means.

The nature of the infiltrating cells is not doubtful. I agree with previous workers that they belong to the lymphocytic series and can be called large lymphocytes. The reticulum does not form collagen, not even in very large foci. It resembles the cytogenic tissue which forms the stroma of normal lymph-follicles.

Indeed the whole focus is nothing, but a rapidly proliferating lymph-follicle and it is not astonishing that it should develop where such structures normally take their origin (as in spleen, lymph-glands, etc.), in the adventitia of the small arteries. In the periphery of large foci, one can see the infiltration following the lymph sheaths of small arteries. It seems that this preference for the arterial tree is also the reason for the development of large solid foci, the proliferation following main stems and branches until the arterial tree is covered.

The autochthonic elements of the kidney also show changes, but these are less constant and overshadowed by the changes mentioned above. They have in the present study received careful attention in view of the opinions of previous workers who were inclined to make them the foundation of their interpretation of the whole process.

The parenchymatous elements show remarkably little change. In the tissue invaded by small foci glomeruli and tubuli even when surrounded by the round-cell accumulation may appear quite normal, or show only very slight alterations. In the depth of the large foci they can be seen widely separated by the increased interstitium. Pycnosis and karyolysis is present in some of the cells and mechanical deformation occurs quite frequently. But even in the middle of large foci tubuli and glomeruli may be found quite normal.

I have not been able to confirm the statements of previous observers with regard to the bloodvessels. The result of their examination was negative as far as intima and media are concerned. Even in the centre of large foci both were found intact. The adventitia, however, is almost invariably infiltrated with the round cells, and as has been pointed out already forms part of the foci. In a fair number of cases the veins are compressed when passing through a dense lymphocytic infiltration and distally much widened and filled with blood. In the neighbourhood of widened veins the interstitium often shows extravascular red cells, sometimes in considerable number. However, widened veins and extravasation are also found where no structure of veins can be detected or even where no lymphocytic proliferation is present.

In the lumina of the bloodvessels, especially the capillary vessels, the number of lymphocytes may be considerably increased. A large percentage of these cells are infected with Koch's bodies.

The Lesions of the Liver.

The general structural plan of this organ is not disturbed. In some cases the interstitium is considerably enlarged by round-cell infiltration. (Fig. 12.)

Central veins and intralobular capillary vessels are of normal width, rarely widened. They contain a varying, but in most cases a considerably increased number of nucleated cells. The proportion of the nucleated cells in the capillary vessels is greater than in either the hepatic or the portal vein branches, and very much greater than in general circulation. The quotient white to red is very often 1 to

20 instead of 1 to 10,000 in the jugular blood. In some cases the white cells are even more numerous than the red cells in the capillary lumina. The majority of these nucleated cells possess roundish or slightly irregular nuclei of the size of those found in lymphocytes or lymphoblasts. They are trachychromatic: coarse basophile granules fill the nucleus. Occasionally these are arranged so that the clearer nucleoplasm in between gives a wheel-spoke-pattern. The cell body is either present as a shallow zone of cytoplasm surrounding the nucleus or it has a greater depth on one side where usually an accumulation of granules is seen. These granules take basic stains easily, and with Giemsa stain metachromatically. In every respect they resemble the Koch bodies seen in the smear. The outline of the parasitic cellbody enveloping the multiple nuclei is often distinctly visible. Their identity with Koch bodies is further confirmed by the fact that blood derived from the vascular system of the extirpated liver contains numerous lymphocytes of which 70 to 100 per cent. are infected with Koch bodies. In most cases the majority of the intracapillary lymphocytes encountered in liver sections are infected (60 to 100 per cent.). The cytoplasm stains bright red with Pappenheims methylgreen-pyronin stain, gives a negative oxydase reaction (Graef-v. Gierke-Schultze), and in other cases stained intravitaly with lithion-carmin the cytoplasm is free from carmine granules, whereas most of the endothelial cells lining the capillary vessels become packed full of them.

A remarkably large number of these intravascular lymphocytes show mitosis.

Since local lymphocytaemia occurs to some degree in many diseases, and there is an uneven distribution of cells even in normal animals, I wish to emphasize that the lymphocytaemia of the liver in East Coast fever is very marked, exceeding that observed in other diseases commonly met in this country, with the exception of Snot-ziekte.

There are other nucleated cells present in the intralobular capillary vessels, but in a far smaller number; cells of macrophaga habitus, not seldom loaded with pigment, rarely neutrophile leucocytes which are easily seen with the help of the oxydase reaction.

Occasionally lymphocytes have been seen in the cytoplasm of Kupffer cells.

The parenchyma cells in most cases show fairly definite, but not extensive degenerative changes. There may be a diffuse fatty infiltration or hyaline drops staining pink with eosin and brownish yellow with Haemalum-van Gieson. A moderate number of nuclei show pyknosis, karyolysis, rarely karyorrhexis. In some cases large nuclei are found with regular spherical basophile granules in the periphery, and as a whole rather deeply stained with basic dyes. It may be that these nuclei belong to young cells and indicate a slightly increased proliferation of epithelial cells.

The most striking changes, however, are found in the periportal interstitia, not in all, but in most of the cases.

There is a dense and more or less extensive infiltration with round cells. These have a roundish or slightly irregular nucleus of about the size of those usually met in lymphocytes and lymphoblasts.

Like these they show a fairly coarse granular basic stain. Mitoses are very frequent in larger foci. The cytoplasm is more or less distinctly basophile. A large proportion of these cells (80 to

100 per cent.) contains Koch's bodies. The cells do not give the oxydase reaction; and do not stain intravitaly with carmine. The decision whether specific lymphocytic granula are present (Kiyono's modification of the Altmann-Schridde stain, Mallory's stain) is rendered difficult by the presence of the parasites.

All the facts, however, seem to indicate that the cells belong to the lymphocytic series, most of them to the larger members of the group, the lymphoblasts. Larger accumulations show a cellular reticulum analogous to that seen in the kidney.

It is much more difficult in the liver than in the kidney to decide where the cell accumulation has taken its origin. In all our experimental cases they are absent in the neighbourhood of the subobar veins. In the periportal spaces small accumulations lie alongside bile ducts or arterioles, large accumulations fill the whole periportal interstitium.

Lesions in Various other Organs.

The material at my disposal was as a whole unsuitable for the study of lesions other than those of the kidney and the liver. From protracted cases with extensive lesions only kidneys were available at the time and all the experimental cases took such an acute course that the lesions remained comparatively small.

Distinct alterations have, however, been found in the lymph-glands and the lungs.

In the lymphglands the follicles are enlarged, the centres of Flemming indistinct, a large proportion of the lymphocytes and the lymphoblasts is infected with Koch's bodies. In some of the cases there is a moderate desquamation of cells of endothelial habitus into the margina and the medullary sinuses.

In the lungs the lesions resemble somewhat those found in the liver, but are much less developed, only detectable on careful examination. The capillary vessels contained a large number of lymphocytes, some infected with Koch's bodies, few with pycnotic nuclei. Small lymphoid accumulations around arterioles were noted in a few instances.

III. CHANGES IN THE BLOOD PICTURE.

It was long known that the lymphocyte plays a prominent part in the pathology of East Coast fever. The study of the morphological changes in the blood promised to give interesting information.

Methods.—Wherever it was possible the animal's blood has been studied for a good while before it became infected. The infection was produced by the infestation with infected ticks. In some cases smears were taken from the prescapular lymphglands. After clipping the hair in the region and cleaning with alcohol a sterile stout needle is inserted into the gland. While it is withdrawn the free opening is closed with a finger. The smears are stained in the same way as the blood smears.

For the differential leucocytic counts and the morphological study of the cells the blood was taken first directly from the jugular vein and smears made on the spot in the usual way. The air-dried smears were stained with the successive combination of May-Gruenwald and Giemsa indicated by Pappenheim.

Later smears were made from the citrated blood after thoroughly mixing the sample. In this case it was found advisable to use a neutral phosphate buffer solution for the dilution of the Giemsa stock-solution.

The absolute number of red and white cells and the volume percentage of red cells were determined on a citrated sample of blood. Nesor's advice to collect comparatively large samples of blood which were kept from coagulation by the addition of sodium citrate, was found very excellent. The technique is more simple and the accuracy of the results naturally higher than when working with small samples usually taken from human patients.

With a view to gain information as to the distribution of the cells in the body samples were collected in the latest stage of the disease during the chloroform narcosis and immediately after death. The animal was placed on the table and secured lying on the right side. All blood samples were taken by means of record syringes and needles, the syringes already provided with the necessary amount of sodium citrate. The first sample was taken from the jugular vein. This sample will be referred to as "taken before narcosis." The animal was then put under deep chloroform narcosis. A second sample was taken from the jugular vein, in some cases also from the left carotid artery. A large opening was made in the abdominal wall, samples taken from various abdominal bloodvessels, the vessels of spleen, liver, and kidney ligatured, and these organs removed from the cavity.

Samples taken out of these ligatured vessels will be referred to as "taken from the extirpated organs." After partial removal of the diaphragm samples were taken from the ventricles and the vena cava caudalis. Death soon set in after this was done and further samples taken are mentioned as "taken after death."

Three normal calves of similar age were subjected to the same procedure to serve as controls.

The results are given on tables 3-15 and graphs 1-9.

It will be seen from these records that with the onset of fever the leucocytes decrease in number and do so progressively until death. All the cells take part in this decrease. The circulating blood in various blood-vessels obtained during narcosis shows little difference in composition (Table 1), but when the blood is taken after death or from the isolated organ very numerous lymphocytes are found to stagnate in their vascular system. Apparently they stick to the walls of the bloodvessels, may be through electrical forces of adhesion and are withheld from the blood leaving the organ by the veins. Such local leucocytoses occur normally and are evident from every section, but in East Coast fever the difference in the number of white cells free in circulation and in the organ blood is far more pronounced, as the following figures show:—

Table 1.

Number of Animal.	Lymphocytes pro c.mm. Blood.		Held Back in Liver.	Pro-portion.
	Free in Circulation.			
328	East Coast fever.....	3,000	27,000	1/9
681	" " 	2,000	381,000	1/190
607	" " 	2,000	84,000	1/42
555	" " 	1,000	64,000	1/64
616	" " 	100	30,000	1/300
1,106	Normal.....	12,000	20,000	1/2
1,134	" 	20,000	46,000	1/2
1,105	" 	13,000	23,000	1/2

In spite of this retention of lymphocytes in the internal organs the question as to what becomes of the leucocytes is not satisfactorily answered. Many of the lymphocytes held back show karyokinesis. It might be that they proliferate in these localities. Of the neutrophils and the other leucocytes there is practically no trace. Probably all the types undergo rapid destruction. A certain number of lymphocytes show pycnosis and karyorrhexis, the proportion is given in tables 8, 9, 13, 14, figures 1, 3, and 4. Occasionally forms were met with which appeared to be degenerated leucocytes. (Fig. 2.) Since the leucocytes are less resistant cells it seems possible that their destruction, once begun, is so rapid that the chances to meet them in the process are extremely small.

There is no doubt that the leucopenia is not only due to a change in the distribution of the white cells, but also to destruction going on together with their accumulation in certain vascular areas, mainly that of the liver.

IV. DISCUSSION.

The alterations which occupy the foreground in the anatomical picture of East Coast fever is proliferation of lymphoid tissue. It is located in the adventitia of arterioles, i.e. in a position favoured by lymphoid tissue not only under pathological, but also under normal conditions. In kidney and liver of normal ruminants there are no perivascular lymphocytic accumulations with any regularity. Those commonly found in adult horses of this country are probably due to some noxe.

In cases where the periarteriolar proliferation reaches large dimensions the autochthonic tissues also show changes: venous stagnation, haemorrhagic infiltration, mechanical deformation, and degenerative changes in the epithelial elements. But these changes are much less marked than those of the lymphoid tissue and often very slight in areas where the lymphoid proliferation invades the interstitium en masse.

It seems fair to assume that the infection of lymphocytes with the parasite is the cause of this proliferation. Two possibilities suggest themselves: (1) the presence of the Koch's bodies in a cell might be a stimulus to proliferation; (2) the presence of Koch's bodies in numerous lymphocytes might interfere with the function in the household of the organism and consequently lead to a compensatory hyperplasia of the lymphoid tissue.

It would perhaps be possible to eliminate one of these possibilities if protracted cases were studied in various stages of the development of these local lesions.

How does the infection reach the adventitia of the arterioles or perivascular lymph-spaces? Lymphocytes are wandering cells which we know can pass through the walls of capillary vessels. If they carry parasites they will constitute the vehicles to bring them wherever the conditions are favourable for their development.

In my material I have seen more perivascular roundcell infiltrations without diapedesis of red cells than with such changes. I failed to find the changes in the intima mentioned in the literature although I was in a position to compare normal and pathological material fixed within a few minutes after death. I would say at least that marked changes in the endothelial cells (such as swelling) do not form an essential part of the histological picture of East Coast fever.

At the present time the white foci of the kidneys in East Coast fever go under the name of Nephritis interstitialis. Even K. F. Meyer who seemed to be impressed by their lymphoma-like appearance keeps to this designation.

To avoid misunderstandings in the discussion of this question, I should like to restrict the meaning of inflammation to a defensive reaction of the mesenchyma against foreign material.

Is the proliferation of lymphoid tissue in East Coast fever part of the defensive activity of the mesenchyma?

The lymphocytes proliferate without much damage to the intruder, their proliferation even fosters the growth of the parasite. There is in the case of the lymphocytes a peculiar tolerance between the parasite and the host, a tolerance similar to that existing between red cell and gametocytes. It is well known that even when the majority of the erythrocytes are infected there is very little or no anemia. Further, the other mesenchymatous elements remain quiet: in most acute cases there is no exudation and in protracted cases even large foci can be entirely devoid of fibroblastic activity.

In those fewer cases where degenerative changes are present in the epithelial elements, and diapedesis of blood cells takes place these alterations in large foci are in no proportion to the massive lymphoid proliferation. They do not exceed similar alterations observed in typical benign and malignant lymphomata.

In short the changes in the kidney, liver, and lungs as far as they are typical for East Coast fever are not of an inflammatory nature. I would propose to replace the designation Nephritis interstitialis by Lymphadenosis aleucaemica parasitaria.

SUMMARY.

(1) The pathological picture of East Coast fever is dominated by a proliferation of lymphoid tissue which it is proposed to describe as lymphadenosis aleucaemica parasitaria.

(2) The white foci in the kidney are the result of a perivascular proliferation of lymphoid tissue which is not of an inflammatory nature.

(3) Acute cases of East Coast fever show a marked leucopenia which sets in with the fever; at the same time there is accumulation of lymphocytes in the capillary bed of various internal organs, mainly the liver.

TABLE 2.—BOVINE 280.

Date	Time.	Red. (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	
					L.	M.	N.	E.	B.	L.	M.	N.			
12.2.23	p.m.	43	9.6	15,100	75	8	15	1	1	10,000	1,000	2,000	—	—	—
19.2.23	"	42	10.3	16,800	6.9	7	22	1	1	12,000	1,000	4,000	—	—	—
21.2.23	"	33	8.5	15,800	71	9	20	—	—	11,000	1,500	3,000	—	—	—
23.2.23	"	34	8.1	20,700	58	5	34	2	1	12,000	1,000	7,000	—	—	—
26.2.23	a.m.	35	9.7	11,200	73	10	15	2	—	8,000	1,000	1,500	—	—	—
28.2.23	p.m.	36	8.2	14,600	72	6	22	0	—	10,500	880	3,000	—	—	—
2.3.23	"	37	9.6	15,300	70	3	25	1	1	11,000	500	4,000	—	—	—
5.3.23	"	—	8.8	17,900	75	7	15	2	1	13,000	1,200	2,500	—	—	—
7.3.23	"	29.3	7.6	18,500	73	5	21	1	—	13,500	900	3,900	—	—	—
8.3.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
9.3.23	p.m.	30	9.1	10,400	75	4	20	1	—	7,800	400	2,000	—	—	Infested with East Coast Fever infected Nymphae of Rhipic. appendic.
12.3.23	"	30	8.7	17,000	71	6	22	1	—	12,000	1,000	3,800	—	—	—
14.3.23	"	28	8.7	15,000	78	7	14	1	—	12,000	1,000	2,000	—	—	—
16.3.23	"	30	8.6	15,000	72	9	18	0	1	11,000	1,400	2,800	—	—	—
17.3.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
19.3.23	"	26	6.9	11,000	66	8	26	—	—	7,000	900	3,000	<1/100	>1/500	No Koch's bodies.
20.5.23	"	23	7.2	12,600	67	7	26	—	—	8,400	900	3,000	<1/100	>1/500	No Koch's bodies.
21.3.23	"	22	5.8	9,800	66	8	26	—	—	6,500	800	2,500	<1/100	>1/500	No Koch's bodies.
22.3.23	"	21	6.2	3,500	77	2	20	1	—	2,700	70	700	1/100	>1/500	Few Koch's bodies.
23.3.23	"	21	5.7	2,300	96	1	2	—	—	2,200	20	50	1/14	1/200	Fair number of Koch's bodies.
24.3.23	a.m.	21.5	5.9	500	100	—	—	—	—	500	—	—	1/2	1/100	Numerous Koch's bodies.
25.3.23	"	—	5.7	500	100	—	>2.5 >5	—	—	500	—	>12 >25	<1/2 <1/10	1/20	Few Koch's bodies. Exitus.

253

TABLE 3.—BOVINE 328.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	
					L.	M.	N.	E.	B.	L.	M.	N.			
18.4.23	p.m.	35	10·3	4,800	58	5	33	4	—	2,800	240	1,400	—	—	Infected with <i>Rhip.</i> <i>append. nymphae</i> (inf. with <i>Th. parva</i>)
21.4.23	"	33	8·9	8,400	76	3	18	3	—	6,400	250	1,500	—	—	—
23.4.23	"	34	9·3	9,500	—	—	—	—	—	—	—	—	—	—	—
25.4.23	"	33	9·7	10,500	57	5	35	3	—	6,000	530	3,700	—	—	—
26.4.23	"	34	9·5	4,500	66	9	21	3	1	3,000	400	900	—	—	—
27.4.23	"	32	10·8	8,900	64	5	28	2	1	5,700	400	2,500	—	—	—
28.4.23	"	27	7·9	4,900	71	5	22	2	—	3,500	250	1,100	—	—	—
29.4.23	"	25	7·6	7,400	46	12	42	—	—	3,400	900	3,100	—	—	—
30.4.23	"	25	7·2	4,400	57	10	33	—	—	2,500	440	1,500	<1/100	<1/500	No Koch bodies in lymph glands.
1.5.23	"	28	7·5	3,500	77	4	19	—	—	2,700	140	670	<1/100	<1/500	—
2.5.23	"	24	7·1	4,300	80	4	15	0	1	3,400	170	650	<1/100	<1/500	Koch bodies rare in lymph glands.
3.5.23	"	18	5·2	4,800	82	3	15	—	—	4,000	140	720	—	—	—
4.5.23	"	19	6·2	3,100	76	1	23	—	—	2,300	30	700	<1/100	<1/500	Few Koch bodies in lymph glands.
5.5.23	"	18	5·0	800	71	3	26	—	—	570	25	200	1/50	<1/500	Fairly numerous Koch bodies in lymph glands.

TABLE 3—(continued).
 SAMPLES TAKEN IN NARCOSIS.

	Red. (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	
				L.	M.	N.	E.	B.	L.	M.	N.			
5.5.23.														
1. Jugular vein.....	20	3·6	3,100	—	—	—	—	—	—	—	—	—	—	—
2. Portal vein.....	17	4·5	2,000	—	—	—	—	—	—	—	—	—	—	—
3. Vena cava caudalis.....	14	3·6	3,000	—	—	—	—	—	—	—	—	—	—	—
4. Left heart (agone).....	18	4·5	1,600	—	—	—	—	—	—	—	—	—	—	—
5. Right heart (agone).....	19	4·6	1,400	—	—	—	—	—	—	—	—	—	—	—

SMEARS FROM STAGNATING BLOOD AFTER DEATH.
 (White count calculated from relation White C./Red C.)

	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.
				L.	M.	N.	E.	B.	L.	M.	N.		
1. Jugular vein.....	—	—	—	—	—	—	—	—	—	—	—	Per Cent.	—
2. Portal vein.....	—	—	2,700	93	1	6	—	—	—	—	—	55	<1/200
3. Vena cava caudalis.....	—	—	7,000	93	1	6	—	—	—	—	—	39	<1/200
4. Left heart.....	—	—	—	79	3	18	—	—	—	—	—	7	<1/200
5. Right heart.....	—	—	<2,000	84	3	13	—	—	—	—	—	28	<1/200

TABLE 4.—BOVINE 330.

Date.	Red (per Cent.)	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.		
				L.	M.	N.	E.	B.	L.	M.	N.				
18.4.23	25	6.2	13,800	—	—	—	—	—	—	—	—	—	—	—	—
21.4.23	22	4.5	18,000	82	4	14	0	0	15,000	700	2,500	—	—	—	—
23.4.23	24	5.4	20,000	76	5	18	1	0	15,000	1,000	3,500	—	—	—	—
25.4.23	30	5.9	20,700	84	6	10	0	0	17,000	1,200	2,000	—	—	—	—
26.4.23	23	4.8	15,700	77	6	17	0	0	12,000	1,000	2,500	—	—	—	—
27.4.23	26	5.4	16,000	87	4	8	0	1	14,000	600	1,300	—	—	—	—
28.4.23	23	4.3	15,000	80	6	13	0	1	12,000	900	2,000	—	—	—	—
29.4.23	26	5.0	16,900	—	—	—	—	—	—	—	—	—	—	—	—
30.4.23	22	4.8	13,000	76	5	18	1	0	10,000	650	2,500	<1/200	0	—	No Koch bodies in lymphglands.
1.5.23	24	5.6	11,000	80	3	17	0	0	9,000	300	2,000	—	—	—	—
2.5.23	26	5.5	8,200	78	5	16	0	0	6,000	400	1,300	<1/100	<1/500	—	Few Koch bodies in lymphglands.
3.5.23	25	5.1	1,800	94	2	4	0	0	1,700	36	72	1/9	<1/100	—	Few Koch bodies in Lymphglands.
4.5.23	24	6.4	1,000	94*	0	6	0	0	900	—	60	1/3	1/100	—	Few Koch bodies in Lymphglands.
5.5.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Exitus.

* 1/10 pyknotic.

TABLE 5.—BOVINE 403.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	
					L.	M.	N.	E.	B.	L.	M.	N.			
15.2.23	p.m.	42	9.0	11,300	63	9	20	8	0	7,000	1,000	2,000	—	—	—
19.2.23	"	42	8.7	10,400	63	16	18	3	0	6,500	1,500	1,900	—	—	Infected with East Coast Fever infected nymphae of <i>Rhipice- phalus capensis</i>
20.2.23	"	—	—	—	65	12	16	7	0	—	—	—	—	—	—
21.2.23	"	38	8.6	9,500	71	8	16	5	0	6,700	—	—	—	—	—
23.2.23	"	42	9.1	9,500	69	5	18	7	1	6,600	450	1,500	—	—	—
26.2.23	"	38	9.9	13,100	50	9	39	2	0	6,500	500	1,700	—	—	—
28.2.23	"	38	8.0	9,700	65	6	23	5	0	6,300	1,200	5,100	—	—	—
2.3.23	"	38	7.6	7,700	65	10	23	7	0	6,300	600	2,000	—	—	—
5.3.23	"	—	7.3	4,000	68	17	1	7	1	5,000	800	1,300	<1/100	<1/500	—
6.3.23	"	—	—	—	—	15	1	3	0	2,700	600	1,000	<1/100	<1/500	—
7.3.23	"	29.5	6.8	3,700	51	—	—	—	—	—	—	—	—	—	No Koch bodies in lymph glands.
8.3.23	"	—	—	—	—	11	37	1	0	1,900	400	1,400	<1/100	<1/500	—
9.3.23	"	25	5.8	500	91	2.2	6.6	0	0	460	10	30	1/12	1/25	No Koch bodies in lymph glands. Numerous Koch bodies in lymph glands
10.3.23	"	—	—	—	—	—	—	—	—	—	—	—	—	—	Numerous Koch bodies in lymph glands. Exitus.

TABLE 6.—BOVINE 547.

	Red Count.	White Count.	Differential Count.					Infected Lymphocytes.	Infected Erythrocytes.
			L.	M.	N.	E.	B.		
30.5.23—Samples taken in the moribund and ural	before and in	narcosis :—							
Jug. vein before narcosis.....	4.6	2,500	75	1	24	0	0	1/50	1/150
Jug. vein in narcosis.....	4.8	3,000	64	7	29	0	0	1/100	1/300
Art. carotis in narcosis.....	4.2	3,900	64	11	25	0	0	1/100	1/200
Splen. vein in narcosis.....	3.8	5,500	72	7	20	0	0	1/25	1/150
Partial vein in narcosis.....	4.5	4,200	63	6	31	0	0	1/120	1/50
Vena cava caud. in agone.....	3.2	5,500	76	5	19	0	0	1/150	<1/500
Right heart.....	3.9	3,800	83	3	14	0	0	1/50	1/500
Left heart.....	4.2	4,500	77	3	20	0	0	1/100	<1/500

TABLE 7.—BOVINE 555.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	
					L.	M.	N.	E.	B.	L.	M.	N.			
17.11.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	<i>Rhip. append. adults, batch 402.</i>
19.11.23	a.m.	33	7.1	14,200	63	3	33	0	1	9,000	400	5,000	0	0	
22.11.23	"	30	8.7	12,800	66	4	29	0	1	8,000	500	4,000	0	0	
26.11.23	"	32	7.8	14,600	61	3	36	0	0	9,000	400	5,000	0	0	
28.11.23	"	31	7.9	12,500	73	5	21	0	1	9,000	600	3,000	0	0	
"	p.m.	30	7.3	12,700	69	7	23	0	1	9,000	900	3,000	0	0	
29.11.23	"	29	8.4	14,600	69	6	25	0	0	10,000	900	4,000	<1/100	0	
30.11.23	a.m.	29	7.3	10,900	61	6	33	0	0	7,000	700	4,000	<1/100	0	
1.12.23	"	31	6.6	10,000	59	6	35	0	0	6,000	600	3,500	1/100	Rare	
2.12.23	"	27	7.1	8,600	50	4	46	0	0	4,000	300	4,000	1/50	<1/500	
3.12.23	"	32	8.7	5,500	—	—	—	—	—	—	—	—	—	<1/500	
4.12.23	"	28	6.1	1,400	86*	5	9	0	0	1,200	70	130	1/10	1/50	Numerous bodies in smears. Koch gland
5.12.23	"	29	7.5	400	92†	4	4	0	0	370	15	15	1/2	1/10	

* Rare karyorrhetic lymphocytes.

† Few necrobiotic lymphocytes.

TABLE 7—(continued).

SAMPLES TAKEN BEFORE NARCOSIS, IN NARCOSIS, AND AFTER DEATH.

	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythrocyt.	
			L.	M.	N.	E.	B.	L.	M.	N.			
Jug. vein before narcosis	7·9	1,300	96*	0	4	0	0	—	—	—	1/3	1/5	
Jug. vein in narcosis...	8·7	600	100*	0	0	0	0	—	—	—	1/3	1/5	
Splen. vein in narcosis..	7·8	1,500	98*	0	2	0	0	—	—	—	1/2	1/4	
Splen. vein on extirp.													
spleen.....	4·3	5,300	97*	1	2	0	0	—	—	—	4/5	1/4	
Portal vein on extirp.													
liver.....	10·0	37,000	100*	0	0	0	0	—	—	—	3/4	1/4	
Portal vein on extirp.													
liver (last sample)....	12·5	33,000	99*	0	1	0	0	—	—	—	1/2	1/4	* Few necroblotic nuclei.
Vena cava caudalis on													
extirp., liver.....	7·4	64,800	100*	0	0	0	0	—	—	—	1/2	1/4	
Pulm. art. on extirp., lung	8·3	25,000	100*	0	1	0	0	—	—	—	3/4	1/4	
Pulm. vein on extirp., ²													
lung.....	6·2	8,100	99*	0	1	0	0	—	—	—	3/4	1/6	
Renal vein on extirp.,													
kidney.....	2·8	23,000	97*	1	2	0	0	—	—	—	2/3	1/4	
Right heart.....	6·4	2,200	100*	0	0	0	0	—	—	—	1/2	1/4	
Left heart.....	8·5	4,300	100*	0	0	0	0	—	—	—	3/4	1/4	

TABLE 8.—BOVINE 607.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	
					L.	M.	N.	E.	B.	L.	M.	N.			
17.11.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Infested with infected ticks.
20.11.23	a.m.	34	6.66	9,100	78	1	18	2	1	7,000	100	1,500	—	—	—
23.11.23	"	33	6.7	11,800	73	6	18	3	0	9,000	700	2,000	—	—	—
27.11.23	"	31	6.4	5,700	78	5	16	1	0	4,000	300	900	0	0	—
29.11.23	"	26	5.5**	6,700	69*	5	25	1	0	4,000	300	1,500	1/100	0	* Rare pyknosis in L ** Few normoblast.
30.11.23	"	24	5.5	5,600	77	6	17	0	0	4,000	300	1,000	1/100	0	—
1.12.23	"	21	4.9	4,800	73	3	23	1	0	3,000	150	1,000	1/100	0	—
2.12.23	"	25	4.3	2,700	87*	1	18	0	0	2,000	30	500	1/40	0	* No pyknosis or karyorrhesis in L
3.12.23	"	27	5.8	4,100	—	—	—	—	—	—	—	—	—	—	—
4.12.23	"	31	5.8	1,400	97*	2	1	0	0	1,500	25	15	1/2	1/8	Numerous Koch bodies in gland smears. * 1/30 pyknosis.

SAMPLES TAKEN BEFORE NARCOSIS, DURING NARCOSIS, AND AFTER DEATH.

	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.			
			L.	M.	N.	E.	B.	L.	M.	N.					
4.12.23.															
1. Jug. vein before narcosis...	6.36	2,100	100*	0	0	0	0	—	—	—	1/2	1/6	* 1/5 pyknosis, 1/5 karyorrhesis.		
2. Jug. vein in narcosis.....	6.4	1,500	99*	1	1	0	0	—	—	—	1/2	1/7	* 1/20 karyorrhesis.		
3. Splen. vein in agone.....	5.5	8,600	99*	1	0	0	0	—	—	—	3/4	1/7	* 1/30 pyknosis, 1/15 karyorrhesis.		
4. Splen. vein II.....	7.0	28,100	100*	0	0	0	0	—	—	—	4/5	1/5	* 1/30 pyknosis, 1/30 karyorrhesis.		
5. Portal vein I.....	5.2	17,500	100*	0	0	0	0	—	—	—	10/11	1/6	* 1/6 pyknosis, 1/10 karyorrhesis.		
6. Portal vein on ext. liver...	6.52	62,400	100*	0	0	0	0	—	—	—	19/20	1/6	* 1/5 pyknosis, 1/10 karyorrhesis.		
7. Portal vein on ext. liver II	3.52	72,400	100*	0	0	0	0	—	—	—	9/10	1/4	* 1/20 pyknosis, 1/50 karyorrhesis.		
8. Vena cava caudalis on ext. liver.....	3.64	84,400	100*	0	0	0	0	—	—	—	19/20	1/6	* 1/10 pyknosis, 1/10 karyorrhesis.		
9. Pulm. art. on ext. lung....	1.5	7,400	100*	0	0	0	0	—	—	—	3/4	1/6	* 1/10 pyknosis, 1/20 karyorrhesis.		
10. Pulm. vein on ext. lung....	3.3	3,600	99*	1	0	0	0	—	—	—	11/12	1/6	* 1/8 pyknosis, 1/6 karyorrhesis.		
11. Renal vein on ext. kidney..	2.0	8,600	100*	0	0	0	0	—	—	—	3/4	1/6	* 1/20 pyknosis, 1/4 karyorrhesis.		
12. Renal art. on ext. kidney..	7.6	4,600	100*	0	0	0	0	—	—	—	5/6	1/6	* 1/3 pyknosis, 1/5 karyorrhesis.		
13. Right heart, post mortem..	4.0	3,000	99*	0	0	0	0	—	—	—	2/3	1/10	* 1/7 pyknosis, few karyorrhesis.		
14. Left heart, post mortem....	3.6	3,400	98*	1	0	0	0	—	—	—	1/3	1/8	* 1/5 pyknosis, 1/20 karyorrhesis.		
15. Vena max. ext.....	4.4	6,300	100*	0	0	0	0	—	—	—	1/6	1/8	* 1/10 pyknosis, 1/3 karyorrhesis.		
16. Mesent. vein.....	4.0	2,600	97*	0	0	0	0	—	—	—	3/4	1/8	* 1/10 pyknosis.		

TABLE 9.—BOVINE 616.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.		
					L.	M.	N.	E.	B.	L.	M.	N.				
11.9.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Infested with infected ticks.
13.9.23	a.m.	35	8.6	11,200	69	5	23	3	0	7,700	550	2,600	—	—	—	—
14.9.23	"	40	8.9	9,300	77	4	17	2	0	7,200	400	1,600	—	—	—	—
15.9.23	"	35	7.7	6,800	68	4	25	3	0	4,600	260	1,700	—	—	—	—
16.9.23	"	—	7.8	8,000	72	7	18	2	1	5,800	560	1,400	—	—	—	—
17.9.23	"	35	8.5	7,000	77	5	16	2	0	5,400	350	1,100	—	—	—	—
18.9.23	"	35	7.9	11,800	68	4	26	1	1	8,000	470	3,100	—	—	—	—
19.9.23	"	31	7.4	6,800	71	4	23	1	1	4,800	270	1,600	—	—	—	—
20.9.23	"	32	6.6	9,200	69	7	22	2	0	6,300	640	2,000	—	—	—	—
21.9.23	"	35	7.3	6,300	78	5	17	0	0	4,900	320	1,100	—	—	—	—
22.9.23	"	32	6.2	6,500	76	5	16	3	0	4,900	330	1,000	—	—	—	—
23.9.23	"	33	7.9	9,000	75	5	18	2	0	6,800	450	1,600	—	—	—	—
24.9.23	"	31	6.5	10,000	52	3	43	2	0	5,200	300	4,300	—	—	—	80 c.c. L. carmine.
25.9.23	"	31	5.4	10,900	43	7	49	1	0	4,700	740	5,300	—	—	—	100 c.c. L. carmine.
26.9.23	"	27	5.9	15,900	35	2	60	2	1	4,700	270	8,000	—	—	—	No Koch bodies in glands.
27.9.23	"	32	7.1	11,800	45	2	51	2	0	5,400	240	6,000	0	0	—	No Koch bodies in glands.
28.9.23	"	31	6.8	10,200	46	3	49	1	1	4,600	300	4,900	<1/100	0	—	—
29.9.23	"	32	7.5	11,100	55	4	40	1	0	6,000	440	4,400	<1/100	0	—	—
1.10.23	"	33	7.4	7,000	67	3	26	4	0	4,700	210	1,800	<1/100	0	—	No Koch bodies in glands.
2.10.23	"	26	5.4	4,900	60	2	37	1	0	3,000	100	1,850	<1/100	<1/500	—	No Koch bodies in glands.
3.10.23	"	26	5.6	4,400	44	4	51	1	0	1,900	180	2,200	—	—	—	Few Koch bodies in glands.
4.10.23	"	27	6.1	1,700	55	0	44	0	0	935	—	750	<1/10	<1/100	—	Few Koch bodies in glands.
5.10.23	"	29	9.2	<100	50	0	50	0	0	<50	—	<50	—	—	—	—

TABLE 9—(continued).

SAMPLES TAKEN BEFORE NARCOSIS, IN NARCOSIS, AND IMMEDIATELY AFTER DEATH.

	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	
			L.	M.	N.	E.	B.	L.	M.	N.			
5.10.23.													
Jug. vein before narcosis.....	6.9	<100	—	—	—	—	—	—	—	—	—	—	—
Jug. vein in narcosis.....	6.9	<100	—	—	—	—	—	—	—	—	—	—	—
L. carolis in narcosis.....	6.5	<100	—	—	—	—	—	—	—	—	—	—	—
Vena portal.....	6.1	<100	—	—	—	—	—	—	—	—	—	—	—
Splen. vein.....	9.1	<100	—	—	—	—	—	—	—	—	—	—	—
Art. coeliaca in narcosis.....	6.3	<100	—	—	—	—	—	—	—	—	—	—	—
Right heart.....	6.2	<100	—	—	—	—	—	—	—	—	—	—	—
Left heart in narcosis.....	6.9	<100	—	—	—	—	—	—	—	—	—	—	—
Vena cava caudalis in narcosis.....	7.6	100	—	—	—	—	—	—	—	—	—	—	—
Vena cava caudalis after death, I.....	6.3	1,300	—	—	—	—	—	—	—	—	—	—	—
Vena cava caudalis after death, II.....	5.8	1,000	—	—	—	—	—	—	—	—	—	—	—
Vena cava caudalis after death, III.....	5.0	3,700	96	0	4	0	0	—	—	—	1/2	1/50	
Vena portae after death, I.....	4.1	2,800	98	0	2	0	0	—	—	—	15/16	1/25	
Vena portae after death, II.....	5.8	4,200	98	0	2	0	0	—	—	—	6/7	1/30	
Vena portae after death, III.....	4.4	30,000	100	0	0	0	0	—	—	—	4/5	1/30	

TABLE 10.—BOVINE 673.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	Lymph Glands.
					L.	M.	N.	E.	B.	L.	M.	N.			
19.10.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Infested with East-Coast-Fever infected ticks (<i>Rhipicephalus Appendic</i>).
26.10.23	a.m.	34	7.5	8,900	68	7	22	2	1	6,000	600	2,000	—	—	—
29.10.23	"	31	5.9	11,400	37	18	43	1	1	4,200	2,000	5,000	—	—	—
30.10.23	"	33	6.7	9,600	34	13	53	0	0	3,300	1,300	5,000	—	—	—
31.10.23	"	35	7.7	12,200	50	7	42	1	0	6,000	800	5,000	—	—	—
1.11.23	"	30	8.3	6,400	58	8	33	1	0	3,700	500	2,100	<1/100	<1/500	No Koch bodies.
2.11.23	"	27	5.8	9,000	62	7	31	0	0	5,600	600	2,800	<1/100	<1/500	No Koch bodies.
3.11.23	"	32	5.9	5,900	61	4	35	0	0	3,600	200	2,000	—	—	Koch bodies rare.
4.11.23	"	28	6.4	1,400	85	2	13	0	0	1,200	30	200	1/50	<1/500	Koch bodies rare.
5.11.23	—	—	—	—	—	—	—	—	—	—	—	—	1/6	1/100	Koch bodies numerous. Exitus.

TABLE 11.—BOVINE 681.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	Lymph Glands.
					L.	M.	N.	E.	B.	L.	M.	N.			
11.10.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Infested with East-Coast-Fever infected ticks.
16.10.23	a.m.	29	4.5	8,300	56	6	37	1	0	4,500	480	3,000	—	—	—
19.10.23	"	35	6.8	10,500	58	6	35	2	1	5,800	600	3,300	—	—	—
22.10.23	"	37	5.2	9,900	66	8	25	1	0	6,500	790	2,500	—	—	—
23.10.23	"	31	5.5	9,000	70	3	25	1	1	6,300	270	2,300	—	—	—
24.10.23	"	25	5.1	4,000	64	7	29	0	0	2,600	280	1,200	<1/100	<1/500	No Koch bodies.
25.10.23	"	27	5.8	13,000	58	13	29	0	0	7,500	430	4,800	<1/100	<1/500	Rare Koch bodies.
26.10.23	"	26	5.0	6,100	54	5	41	0	0	3,500	300	2,500	1/100	1/200	Few Koch bodies.
27.10.23	"	28	6.2	2,500	82	2	16	0	0	2,000	50	400	1/20	1/100	Few Koch bodies.
28.10.23	"	34	6.1	1,000	97	3	0	0	0	1,000	30	—	—	—	—

TABLE 11—(continued).

SAMPLES COLLECTED BEFORE NARCOSIS, IN NARCOSIS, AND IMMEDIATELY AFTER DEATH.

	Red Count.	White Count.	Differential Count.					Pro cub. mm.			Infected Lymphoc.	Infected Erythro.	Lymph Glands.		
			L.	M.	N.	E.	B.	L.	M.	N.					
28.10.23.															
1. Jug. vein before narcosis...	7.9	2,200	*97	3	0	0	0	2,000	50	—	% 78	1/200	* Necrobiosis in <1/100.		
2. Jug. vein in narcosis.....	6.8	2,800	*100	0	0	0	3,000	—	—	87	1/200	* Pyknosis in 1/30, Karyorrhexis in <1/100.			
3. Splen. vein in narcosis.....	8.0	4,500	*100	0	0	0	4,500	—	—	84	1/150	* Pyknosis in 1/100, Karyorrhexis in <1/100.			
4. Portal vein in narcosis.....	4.7	6,400	*97	3	0	0	6,000	100	—	87	1/200	* Pyknosis in 1/100, Karyorrhexis in <1/100.			
5. Splen. vein on extirp. spleen	4.6	25,500	*100	0	0	0	25,000	—	—	86	1/200	* Pyk.osis in 1/100, Karyorrhexis in <1/100.			
6. Portal vein on extirp. liver	5.5	183,500	*97	3	0	0	180,000	5,000	—	92	1/300	*Pyknosis in <1/100, Karyorrhexis in <1/100.			
7. Idem, II.....	7.0	381,000	*100	0	0	0	380,000	—	—	93	1/200	* Pyknosis in <1/100, Karyorrhexis in <1/100.			
8. Vena cava in extirp. liver..	5.1	153,000	*100	0	0	0	160,000	—	—	95	1/400	* Pyknosis in 1/20, Karyorrhexis in <1/100.			
9. Pulm. art. on extirp. lung..	3.5	12,000	*96	1	3	0	11,000	120	400	89	1/300	* Pyknosis in <1/100, Karyorrhexis in <1/100.			
10. Pulm. vein on extirp. lung .	4.0	30,600	*98	0	0	0	30,000	—	—	92	1/300	* Pyknosis in 1/30, Karyorrhexis in 1/200.			
11. Renal vein on extirp. kidney	3.8	10,800	*83	16	1	0	9,000	1,500	100	83	1/200	* Pyknosis in 1/50.			
12. Mesenteric vein.....	5.5	10,000	98	1	1	0	10,000	100	100	96	—	—			
13. Right ventricle.....	4.3	6,600	*99	1	0	0	6,000	600	—	86	—	* Pyknosis in 1/50, Karyorrhexis in 1/100.			
14. Left Ventricle.....	6.2	3,600	*95	4	1	0	3,000	150	50	66	—	—			
15. Left maxillary vein.....	3.5	5,400	*82	13	5	0	4,000	700	250	65	—	* Pyknosis in <1/100, Karyorrhexis in <1/100.			

TABLE 12.—CONTROL CALF 1105.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.	Differential Count.					Pro cub. mm.			
					L.	M.	N.	E.	B.	L.	M.	N.	
22.9.25....	p.m.	34	9.54	14,000	57	3	37	3	0	8,000	400	5,000	* 1/60 Karyorrhesis.
23.9.25....	a.m.	32	8.52	8,700	68*	5	23	2	1	6,000	450	2,000	

SAMPLES TAKEN BEFORE NARCOSIS, DURING NARCOSIS, AND IMMEDIATELY AFTER DEATH.

	Red Count.	White Count.	Differential Count.					Pro cub. mm.			
			L.	M.	N.	E.	B.	L.	M.	N.	
24.9.25.											
1. Jug. vein before narcosis.....	9.6	13,600	81*	4	12	3	0	11,000	550	1,600	* 1/200 Karyorrhesis.
2. Jug. vein in narcosis.....	7.9	12,700	72	4	21	2	1	9,000	500	2,500	---
3. Splen. vein in narcosis.....	6.2	23,100	90	2	10	1	0	21,000	450	2,000	---
4. Art. coeliaca in narcosis.....	8.2	8,500	77	5	16	2	0	6,500	400	1,400	---
5. Vena cava caudalis in narcosis....	7.8	10,400	73	6	17	3	1	7,500	600	1,800	---
6. Splen. vein on ext. spleen.....	5.2	20,200	84	5	10	1	0	17,000	1,000	2,000	---
7. Port. vein on ext. liver.....	6.9	22,900	84	7	7	2	0	19,000	1,500	1,500	---
8. Idem, last sample.....	5.6	17,200	88	3	7	2	0	15,000	500	1,200	---
9. Vena cava on ext. liver.....	5.1	13,700	85	5	9	1	0	12,000	700	1,200	---
10. Pulm. art. on ext. lung.....	7.7	10,300	71	4	22	3	0	7,000	400	2,000	---
11. Right heart.....	7.0	3,700	92	2	5	1	0	---	---	---	Sample partly coag.
12. Left heart.....	3.8	8,400	84	3	10	2	0	---	---	---	" " "
13. Ext. max. vein.....	6.7	7,200	87	4	8	1	0	---	---	---	" " "
14. Mesent. vein.....	6.4	19,800	89	4	6	1	0	17,000	800	1,200	---
15. Omasobomas. vein.....	7.2	6,400	75	5	18	2	0	5,000	300	1,200	---

TABLE 13.—CONTROL CALF 1106.

Date.	Time.	Red (Per Cent.).	Red Count.	White Count.
27.8.25.....	a.m.	31	7.9	9,300
1.9.25.....	p.m.	29	8.6	11,600

SAMPLES TAKEN BEFORE NARCOSIS, DURING NARCOSIS,
AND IMMEDIATELY AFTER DEATH.

	Red Count.	White Count.
3.9.25—		
1. Jug. vein before narcosis.....	11.6	12,500
2. Jug. vein in narcosis.....	9.8	12,200
3. Art. coeliaca in narcosis.....	8.1	4,400
4. Splen. vein in ext. spleen.....	17.3	64,100
5. Port. vein in ext. liver.....	9.6	20,600
6. Port. vein in ext. liver, II.....	7.0	8,100
7. Vena cava in ext. liver.....	8.2	22,300
8. Idem, II.....	8.2	16,200
9. Pulm. art. on ext. lung.....	5.2	36,300
10. Renal vein on ext. kidney.....	7.9	35,300
11. Right heart.....	6.0	9,800
12. Left heart.....	6.2	15,800
13. Ext. max. vein.....	4.6	5,800
14. Mesent. vein.....	5.5	6,600

TABLE 14.—CONTROL CALF 1134.

Date.	Time.	Red (Per Cent.)	Red Count.	White Count.	Differential Count.				
					L.	M.	N.	E.	B.
15.8.25	p.m.	—	12.9	16,100	66	2	31	1	0
18.8.23.....	„	—	11.3	16,200	83	8	19	0	0
19.8.23.....	„	49	11.1	14,800	91	2	7	0	0

SAMPLES TAKEN BEFORE NARCOSIS, DURING NARCOSIS, AND IMMEDIATELY AFTER DEATH.

	Red Count.	White Count.	Differential Count.					
			L.	M.	N.	E.	B.	
20.8.25.								
1. Jug. vein before narcosis.....	11.3	20,600	94	3	12	1	0	
2. Jug. vein in narcosis.....	10.0	16,800	79	4	17	0	0	
3. Vena cava caudalis.....	8.5	12,900	84*	3	11	0	0	* 1/50 Karyorrhesis in lymphocytes.
4. Portal vein in extirp. liver, I.....	8.5	45,300	88	2	6	1	0	
5. Portal vein in extirp. liver, II.....	9.7	45,800	91	1	6	1	0	
6. Vena cava caudalis in extirp. liver.....	8.0	33,200	89*	4	6	0	1	* 1/100 Karyorrhesis in lymphocytes.
7. Renal vein.....	8.8	34,000	89	5	5	0	0	
8. Right heart.....	4.2	9,700	84*	2	8	1	0	* 1/50 Karyorrhesis in lymphocytes.
9. Left heart.....	4.6	4,600	92*	2	3	1	0	* 1/100 Karyorrhesis in lymphocytes.
10. External maxillary vein.....	6.4	12,000	78	3	17	1	0	
11. Mesenteric vein.....	8.0	37,400	79	4	16	0	1	

APPENDIX V (c).—POST-MORTEM FINDINGS IN THE EXPERIMENTAL CASES.

BOVINE 229. HEIFER, 2 YEARS.

Interim 1 hour. Rigor mortis present. Condition fair. Visible mucous membrane pale with slightly yellow tinge. Blood partly coagulated, watery, stains badly. Flesh: pale reddish brown, moist; subcutaneous tissue nothing unusual; superficial lymphglands: bronchial and mediastinal enlarged, reddish green, moist; sublingual and parotid pale, moist. Submaxillary and pharyngeal greatly enlarged.

Peritoneal cavity nothing unusual. Diaphragm nothing unusual. Pleural cavity: small quantity of reddish yellow clear fluid. Costal pleura in neighbourhood of vertebral articulation of last four ribs shows numerous small red confluent spots.

Pericardial sac contains about 3 c.c. of an amber coloured clear fluid. Heart and large vessels: right ventricle and atrium contain uncoagulated blood. Right ostium admits three fingers, left two fingers. Epicard shows numerous pin-point red spots along sulci. Right endocard nothing unusual. Tricuspid valve: gelatinous infiltration. Semilunar valves pale green. Left endocard nothing unusual, reddish area just below semilunar valve. Bicuspid valve shows marked gelatinous infiltration. Myocard left 2 cm., right 1 cm., on section pale reddish brown in colour, transparent, consistency normal, coronary artery nothing unusual. Aorta nothing unusual.

Spleen: $42 \times 1 \times 4$, capsule nothing unusual. On section trabeculae distinct, malpighian bodies very distinct and giving the cut surface a raspberry appearance. Colour dark red, pulp greatly swollen, soft in consistency.

Larynx: contains small quantity of green mucus, vessels slightly injected on dorsal surface, at junction of arythenoids. Trachea: oval greenish yellow focus of fibrous consistency, 1×2 cm., surrounded by red zone. Cervical trachea, vessels slightly injected. Lungs: left lung, pleura smooth, shows several areas in middle of posterior lobe of dark green colour, the areas vary up to 4 cm. in diameter and are irregularly round. On section lung shows large areas dark red in colour and firmer than normal in consistency and alternating with a light red colour of rest of lung to give a marbled appearance. These dark red areas are marked off by the outlines of lobules. On pressure large quantity of reddish white foam exudes. Consistency soft, partly inflated. Bronchi contain reddish white foam. Right lung similar to left. Kidney: left capsule easily detached. Cortex under capsule shows a few pale yellowish-white areas protruding above the surface of the kidney. Cortex on section shows well marked pale green longitudinal striations. Medulla light bluish red, on cutting into white areas of surface they extend for about 2 mm. into the cortex. Colour pale yellow, consistency firm. Right the same as left.

Mouth and tongue nothing unusual. Pharynx nothing unusual. Stomachs I-III nothing unusual. Stomach IV few small ulcers about the size of a three-pence, dark red centre, and reddish black markings. Small intestine: vessels injected, few small ulcers similar to those in 4th stomach. Large intestine: caecum and colon mucous membranes light reddish grey, vessels slightly injected, some of the folds are dark in colour. Liver: capsule normal, on section greenish brown colour, lobulation not distinct, consistency nothing unusual. Large quantity of blood exudes from cut surface.

Pancreas pale yellowish brown. Salivary glands nothing unusual. Suprarenal gland much enlarged, pale green. Bladder: contains dark yellowish turbid urine. Thyroid: pale brown colour. Suprarenal: pale green colour. Sexual organs nothing unusual. Nervous system: brain nothing unusual. Skeleton: bone marrow of humerus and femur shows nothing unusual.

Pathological Anatomical Diagnosis: Swelling of lymphglands, small ulcers in abomasum and intestines, enteritis, pigmentation of liver, oedema of lungs with foci of blood (aspiration), gelatinous infiltration of endocard, haemorrhages in epicard, tumor splenis.

Etiological Diagnosis: East Coast Fever.

BOVINE 280. BULL, 14 MONTHS.

Interim 45 minutes. Rigor mortis not present. Condition fair. Visible mucous membranes: conjunctiva purplish pink, mucous membrane of mouth light purplish pink, anus nothing unusual.

Blood: liquid, fairly well staining. Flesh light brown, nothing unusual. Subcutaneous tissue nothing unusual. Superficial lymphglands: prescapular, precrucial, popliteal, retropharyngeal, bronchial, mediastinal and inguinal glands moderately enlarged (prescapular measuring $2\frac{1}{2} \times 1\frac{1}{2} \times 5$ cm.).

Peritoneal cavity: small amount of clear liquid, peritoneum smooth glistening and transparent. Diaphragm nothing unusual. Pleural cavity nothing unusual.

Pericardial sac nothing unusual, 2-3 c.c. of clear liquid present. Heart normal size and shape. Epicardial fat well developed, fairly numerous red spots and stripes under epicard measuring up to $\frac{1}{2}$ mm. across. Right heart in diastole, empty. Endocard and valves nothing unusual. Left heart in incomplete diastole, moderate number of dark red spots under the endocard, valves nothing unusual. Coronary vessels nothing unusual. Myocard smooth, transparent, reddish brown in colour, of normal consistency. Aorta thoracica nothing unusual.

Nasal passages nothing unusual. Larynx nothing unusual. Trachea nothing unusual. Lungs size and shape of incomplete expiration, normal shape, pleura smooth, glistening and transparent. Colour of surface varies from pink to light pinkish brown. Large bronchi and vessels nothing unusual. Cut surface not bulging, pale, varying from light pink to light red. Small amount of blood stained froth scraped off. Consistency soft, elastic throughout.

Spleen: $40 \times 12 \times 2\frac{3}{8}$. Capsule nothing unusual. Cut surface not bulging, of purplish brown colour. Trabeculae distinct. Malpighian bodies not distinct. Consistency normal, rather firm.

Tongue nothing unusual. Mucous membrane pale. Pharynx nothing unusual. Oesophagus nothing unusual. Stomach I: filled with food of normal appearance, mucous membrane nothing unusual. Stomachs II and III filled with food of normal appearance, stomach III contains soft ingesta. Stomach IV nothing unusual. Small intestine: mucous membrane swollen, marked bright red zebra striations. Large intestine: caecum deeply reddened and besides shows deep red spots near ileocaecal valve; colon mucous membrane in places deeply red and swollen; contents soft. Mesenteric glands enlarged, cut surface shows ramification on grey background. Rectum nothing unusual. Liver slightly enlarged, capsule nothing unusual, colour of surface bright orange brown, cut surface slightly bulging, very smooth, small amount of blood oozes out. Colour even, bright orange yellow. Consistency rather increased, but somewhat friable. Specific weight low.

Pancreas nothing unusual. Salivary glands nothing unusual. Kidney: pericapsular fat well developed. Capsule strips easily. Surface reddish brown; shows a fairly marked, narrow reddish network on cut surface, zones distinct. Cortex brown with few red radial stripes and just visible glomeruli; intermediary zone purple; medulla pink. Bladder: contracted, empty. Mucous membrane shows slight ramification. Nervous system nothing unusual. Skeleton: bone marrow of humerus and femur fatty.

Pathological Anatomical Diagnosis: Swelling of lymphglands, enteritis, swelling of liver, epicardial and endocardial petechiae.

Etiological Diagnosis: East Coast Fever.

BOVINE 283. BULL, 15 MONTHS.

Interim 1 hour. Rigor mortis present. Condition fair. Visible mucous membranes: conjunctiva brownish pink. Mucous membrane of mouth brownish white; yellowish brown viscid liquid, translucent, in conjunctival sac.

Blood coagulated not well staining. Flesh brownish red, in places distinct yellowish brown tinge. Subcutaneous tissue on ventral border of neck shows infiltration with green pigment. Superficial lymphglands: retropharyngeal slightly enlarged, some show a deep green colour, others green foci in greyish background. One of the other cervical lymphglands shows a deep greenish grey cut surface with caseous foci of lighter colour. Tonsils nothing unusual. Left prescapular lymphgland surrounded by blood clot of size of fowl's egg. Cut surface medulla deep red. Left popliteal lymphgland contains caseous yellow matter in firm thick fibrous capsule. Right small. Cortex shows red pin-point sized spots, medulla greenish. Precrural gland: small size. Greenish tinge on cut surface. Right maxillary gland small. Pelvic lymphgland normal size.

Peritoneal cavity: serosa smooth glistening and transparent, distinct yellow tinge. Diaphragm nothing unusual. Pleural cavity: contains small amount of brownish, almost clear liquid. Pericardial sac: 20 c.c. of brownish, almost clear liquid. Heart and large vessels: right heart in diastole, tricuspid admits whole hand. Left heart: systole. Bicuspid admits two fingers. Heart normal size and shape. Epicard, fat moderately developed, yellowish, slightly infiltrated. Fair number of deep red spots under epicard, also stripes. Right heart contains small amount of half coagulated blood. Endocard and valves nothing unusual. Left heart small amount of coagulated blood. Endocard shows a few deep red spots, 1 mm. across, valves nothing unusual. Myocard right 1.3 cm., left 2.5 cm., light brown, slightly opaque, consistence nothing unusual.

Spleen $42 \times 11\frac{1}{2} \times 1.8$. Capsule nothing unusual. Cut surface: edges inverted. Colour deep brownish red. Trabeculae distinct. Pulp fairly easily scraped off. Near posterior margin there is a flat nodule, $1 \times 2 \times 1\frac{1}{2}$ cm., slightly prominent on surface, which on cut surface shows brown centre surrounded by deep red patches. Consistence increased.

Nasal passages: nothing unusual. Larynx: epiglottis shows similar focus as pharynx. Trachea: fair amount of white froth, mucous membrane pale. Lungs: left lung of normal size and shape, pleura smooth and glistening, transparent except on margo obtusus in diaphragmatic lobe where it is slightly thickened and shows a number of fibrous adhesions. Colour light brown to purplish to light purplish brown except in cranial sublobe of diaphragmatic lobe where surface has deep purple colour. Cut surface is brownish red, consistency increased and air content lower. Parenchyma: in the remaining parts cut surface brownish red. Consistence soft elastic but slightly increased throughout. Main bronchus contains yellow froth mixed with fibrinous strings. Main vessels nothing unusual. Right lung like main portion of left.

Mouth nothing unusual. Tongue nothing unusual. Pharynx: 2 ulcers, 1 cm. and 3 cm. in diameter, light greenish brown and bluish grey periphery 3 mm. deep. Consistence that of a rather firm caseous material; similar foci in perilaryngeal part of pharynx. Oesophagus: fair number of elongated erosions, about $1\frac{1}{2}$ cm. in length, slightly prominent dark brownish centre, bluish periphery, with yellow pink surrounding zone.

I-III stomachs nothing unusual; ingesta in III somewhat dry. IV mucous membrane shows occasional deep red spots, 3 mm. across, slight diffuse reddening in pyloric portion. Small intestine: fair number of deep red foci in subserosa which correspond to ulcers in the mucosa, of irregular ovoid shape, up to 2 cm. long, showing a deep yellow caseous centre, which on scraping is easily removed. These ulcers are present in duodenum and first portion of jejunum. In parts irregular red spots of pin-head size and up to 2 cm. across are present, contents semi-liquid. Large intestine: caecum mucous membrane pale, colon ditto. Mesenteric lymphglands nothing unusual. Rectum contains a small amount of dry faeces, mucous membrane nothing unusual. Liver: enlarged, edges, slightly rounded, capsule nothing unusual. Colour of surface light brown to bluish grey with dirty greenish tinges. Cut surface edges slightly everted. Lobulation visible. Moderate amount of blood oozing out. Gall bladder contains about 50 c.c. of a thickish viscous, dark green bile, mucous membrane nothing unusual.

Kidney: pericapsular fat poor, greenish yellow; capsule easily detached. Colour of surface yellowish brown to reddish brown. Cut surface very moist and glistening. Cortex yellowish brown with a few red spots $\frac{1}{2}$ mm. across; intermediary zone and medulla purple. Pelvis nothing unusual. Consistence nothing unusual. Right as left. Bladder filled with deep wine red, almost clear liquid.

Thyroid nothing unusual. Suprarenal: cortex light with deep brownish red stripes. Medulla grey. Sexual organs nothing unusual. Urethra: mucous membrane in first 10 cm. shows deep red infiltration 1 cm. in length, 2 cm. across. Testicles in cut surface show numerous injected blood vessels. Brain nothing unusual. Skeleton: bone marrow humerus fatty, femur fatty with grey focus.

Pathological Anatomical Diagnosis: Greenish discoloration of various organs, due to dye,* caseous foci in upper cervical and left popliteal glands, swelling of all lymphglands, small ulcers in pharynx, necrosis of mucous membrane of oesophagus, ulcers in small intestine, swelling of liver, ulcers in epiglottis, slight pulmonary oedema, haemoglobinuria, epicard and endocardial haemorrhages.

Etiological Diagnosis: East Coast Fever.

BOVINE 284. BULL, 14 MONTHS.

Interim $\frac{3}{4}$ hour. Rigor mortis absent. Condition poor. Conjunctiva pale. Blood: liquid, well staining. Flesh: transparent, light brown. Subcutaneous tissue in maxillary space shows gelatinous infiltration, also on legs and chest.

Superficial lymphglands: retropharyngeal lymphglands small, on section of normal appearance. Left axillary lymphgland hazel-nut size, right as left. Right prescapular $7\frac{1}{2} \times 3 \times 1\frac{1}{2}$. Right precrural $5 \times 2 \times 1\frac{1}{2}$. Right popliteal $4 \times 3 \times 1\frac{1}{2}$, left $4 \times 2 \times 1$.

Peritoneal cavity: peritoneum smooth, glistening; diaphragm nothing unusual, convex forwards. Pleural cavity: nothing unusual. Mouth nothing

* Chemotherapeutical experiment.

unusual. Tongue nothing unusual. Stomachs: I: filled with food of normal appearance, mucous membrane nothing unusual. II: nothing unusual. III: filled with dry ingesta of light greenish grey colour. Mucous membrane nothing unusual. IV: semi-liquid ingesta of greenish colour. Mucous membrane shows diffuse reddening, many irregular patches 2 mm. across of greyish white colour.

Pericardial sac: nothing unusual. Right heart in diastole, ostium admits four fingers; contains liquid blood. Heart normal size and shape. Epicard and valves nothing unusual. Left heart: endocard and valves nothing unusual. Myocard: right nothing unusual, left 2 cm. On section brown, transparent, normal consistency.

Spleen 29×10×2. On section edges everted. Pulp deep reddish brown. Trabeculae and malpighian bodies well visible.

Nasal passages: Mucous membrane injected, small amount of greyish mucus. Larynx: small amount of whitish froth, mucous membrane nothing unusual. Trachea: small amount of whitish froth, mucous membrane nothing unusual.

Lungs: Left lung size of incomplete inspiration, normal shape. Pleura nothing unusual. Colour of surface light pink to light brownish grey. Main bronchi and vessels nothing unusual. Cut surface edges not everted; moderate amount of blood stained froth scraped off, colour brick red to light pink. Consistence soft elastic throughout. Right lung shows higher blood content, otherwise as left. Small intestine: mucous membrane swollen, shows slight diffuse reddening in places, ingesta semi-liquid, deep green. Large intestine: caecum contains soft ingesta of dark green colour. Mucous membrane shows slight arborisation in irregular areas. Colon nothing unusual. Rectum nothing unusual. Mesenteric glands nothing unusual, surface yellowish white, medulla greenish grey, consistency nothing unusual.

Liver of normal size and shape. Capsule nothing unusual. Colour of surface light purple. On section edges everted, colour light brown, lobulation not visible, consistency normal. Gall bladder contains about 50 c.c. of a dark greenish bile, mucous membrane nothing unusual. Pancreas nothing unusual. Salivary glands nothing unusual.

Kidneys. Left: pericapsular fat poor. Capsule easily removed. Colour of surface reddish brown. On section cortex reddish greyish brown, somewhat mottled by presence of greyish areas, $\frac{1}{2}$ mm. across, intermediary zone purple, medulla pink, pelvis nothing unusual. Right kidney same as left; surface light brown, shows four whitish irregular spots, $1\frac{1}{2}$ mm. across, with slight retracted centre which on cut surface continues as a yellowish white-red stripe through cortex, otherwise as left. Sexual organs nothing unusual. Nervous system nothing unusual. Skeleton: bone marrow, humerus half red, half gelatinous.

Pathological Anatomical Diagnosis: Anaemia, anasarca, gastro-enteritis, slight pulmonary oedema.

Etiological Diagnosis: Cachexia.

BOVINE 328. BULL, 1 YEAR.

Interim $\frac{1}{2}$ hour. Rigor mortis absent. Condition poor. Visible mucous membranes: conjunctiva pale. Blood half coagulated, well staining. Flesh nothing unusual. Subcutaneous tissue nothing unusual. Superficial lymph-glands: bronchial lymphglands enlarged, moist, on cut surface light greyish brown. Submaxillary and retropharyngeal lymphglands much enlarged, moist on cut surface, of a greyish colour. Prescapular lymphglands enlarged. Left axillary lymphgland moderately enlarged. Pericardial sac nothing unusual.

Heart: normal size and shape. Epicardial fat tissue well developed. Many bright red spots measuring 1 cm. across under epicard. Right heart in diastole, empty. Few bright red spots under endocard measuring few mm. across. Myocard light brown, slightly opaque, consistency rather soft. Right ventricle 1 cm., left 1.8 cm. Aorta shows a small area of sclerosis.

Spleen 32×9×2, slightly swollen, cut surface dirty brownish purple, edges everted, granular appearance. Trabeculae just visible. Malpighian bodies enlarged. Pulp easily scraped off. Consistency rather soft.

Nasal passages nothing unusual. Larynx contains small amount of greyish mucus. Mucous membrane white. Trachea: mucous membrane white. Lungs: left lung expiratory, size and shape normal. Pleura wrinkled but smooth and transparent. In oral half, slightly dull, in aboral half, a few deep red irregular spots measuring up to 1 cm. across under the pleura. Main bronchus and vessels nothing unusual. Cut surface everted and colour varies from light brown to light purple. Right lung as left.

Mouth nothing unusual. Tongue mucous membrane pale. Pharynx nothing unusual. Oesophagus nothing unusual. Stomachs I-III nothing unusual.

Stomach IV, mucous membrane pale except for a few deep red spots near pyloric end, measuring more or less 1 cm. across. Small intestine: ingesta nothing unusual, mucous membrane slightly swollen, of brownish white colour. Large intestine: caecum and colon contain soft ingesta, mucous membrane nothing unusual. Rectum nothing unusual. Liver normal size and shape, capsule nothing unusual, surface light purplish brown, with few deep red spots of pin-head size under the capsule, on cut surface edges everted. Lobulation fairly distinct, red outlines. Colour light brown, consistency firm but friable. Gall bladder contains about 40 c.c. dark green bile, and a moderate number of deep red pin-point sized spots. Mucous membrane shows slight arborisation. Salivary glands nothing unusual.

Kidney: Pericapsular fat poorly developed, shows slight gelatinous infiltration. Capsule easily detached, surface in majority of reniculi brownish red with many deep red ill-confined spots and stripes of about $\frac{1}{2}$ mm. in diameter which form a network. Few show a light brown colour with a moderate number of red spots. On cut surface light brown in colour. Firm consistency. In other reniculi deep red spots and stripes. Zones distinct. Medulla yellowish white, consistency somewhat friable. Left kidney as right.

Sexual organs nothing unusual. Nervous system nothing unusual. Skeleton: bone marrow humerus and femur fatty, deep red border.

Pathological Anatomical Diagnosis: Swelling of lymphglands, haemorrhages in abomasum, subserosal haemorrhages in liver, epicardial and endocardial haemorrhages, tumor splenis.

Etiological Diagnosis: East Coast Fever, killed *in extremis*.

BOVINE 330. BULL, 1 YEAR.

Interim few hours. Rigor mortis absent. Condition poor. Visible mucous membrane: conjunctiva deep purple, mucous membrane of mouth, colour varies from brownish white to purplish. Skin nothing unusual. Blood: liquid, well staining. Flesh transparent. Subcutaneous tissue nothing unusual. Superficial lymphglands: bronchial glands moderately enlarged, on cut surface show marked arborisation; prescapular lymphglands much enlarged, axillary, retro-pharyngeal, mediastinal, pelvic, precrucial and popliteal lymphglands moderately enlarged.

Peritoneal cavity: organs in position. Peritoneum smooth, glistening and transparent. Diaphragm convex forwards. Pleural cavity: left cavity contains 1,500 c.c. light brownish almost clear liquid. Costal pleura nothing unusual. Pericardial sac contains 100 c.c. of yellowish watery liquid, few fibrous strings.

Heart and large vessels: Right heart: right auriculoventricular orifice admits hand. Ventricle in diastole, contains liquid blood, endocard nothing unusual. Tricuspid valve contains some irregular nodules of deep bluish colour, measuring up to 3 mm. across. On section blood escapes. Left heart: bicuspid valve admits two fingers; ventricle half contracted, contains liquid blood, shows a fair number of deep red spots of pin-head size 1-2 cm. across. Auriculoventricular valves show similar nodules as right. Aortic valves nothing unusual. Coronary artery nothing unusual. Myocard: colour varies from purplish red to light reddish brown in ill-confined alternating areas, slightly opaque, consistency soft.

Spleen: 42×14×21, capsule nothing unusual, cut surface not bulging. Trabeculae distinct, colour reddish brown. Malpighian bodies not visible. Consistency decreased.

Nasal passages nothing unusual. Larynx nothing unusual. Trachea nothing unusual. Lungs: Left lung normal size, shape of inspiration, at base of cardiac lobe, air bubbles in subpleural tissue, in caudal half of diaphragmatic lobe pleura is white and slightly thickened and the subpleural tissue contains watery fluid and air bubbles. Colour of surface varies from light brick red to deep purple. Large bronchi contain large amount of whitish froth. Mucous membrane shows arborisation. Cut surface edges everted, large amount of whitish frothy liquid flowing off. Colour varies from light orange to pink to brownish purple. Interstitia enlarged, contain watery liquid and air bubbles. Consistency slightly decreased, soft elastic, air content slightly decreased. Right lung as left.

Mouth and tongue nothing unusual. Pharynx nothing unusual. Stomachs: rumen: normal size, filled with food of normal appearance, mucous membrane nothing unusual. Reticulum nothing unusual. Omasum nothing unusual, ingesta soft. Abomasum slightly reddened in irregular large ill-confined areas. On height of folds a few irregular erosions up to 2 cm. in width, ground brownish grey in colour, edges deep red and patchy. Small intestine: semi-liquid ingesta, mucous membrane swollen, in most parts show marked ramiform

reddening in large irregular patches. Large intestine: ingesta nothing unusual. Mucous membrane slightly thickened, slightly reddened in several places. Mesenteric glands slightly enlarged. Cut surface in some places ramified. Liver: normal size and shape. Capsule nothing unusual. Colour light purplish brown, except for a few spots measuring about $1\frac{1}{2}$ cm. across, irregular in outline and brownish white in colour, not prominent, transparent through capsule. Cut surface edges slightly everted, small amount of blood flows off, lobulation just visible, colour light yellowish brown, consistency firm and friable. Gall bladder contains 100 c.c. deep yellowish bile, mucous membrane nothing unusual. Pancreas light purplish grey on surface and cut surface, normal consistency.

Kidneys: Right: pericapsular fat poor. Capsule easily detached. Colour of surface pink due to coarse network including greyish brown irregular areas, $\frac{1}{2}$ mm. across, on cut surface cortex slightly everted, shows alternating greyish and reddish brown stripes and zones, intermediary zone deep purple, medulla brick red, pelvis nothing unusual, consistency rather tough. Left kidney as right. Bladder filled with watery urine, mucous membrane pale.

Thyroid nothing unusual. Suprarenal glands nothing unusual. Sexual organs nothing unusual. Nervous system nothing unusual. Skeleton: bone marrow, humerus and femur three-quarters fatty, quarter red.

Pathological Anatomical Diagnosis: Swelling of lymphglands, hydrothorax, small ulcers in abomasum, gastro-enteritis, grey foci in liver, pulmonary oedema, lymphoid foci kidneys, hydropericard, vesiculae haematicae valvulares.

Etiological Diagnosis: East Coast Fever.

BOVINE 403.

Interim 4-5 hours. Rigor mortis present. Visible mucous membranes: conjunctiva pink and very moist. Mucous membrane of mouth brownish white. Blood half coagulated and well staining. Flesh nothing unusual. Subcutaneous tissue nothing unusual. Lymphglands: Prescapular enlarged, precrucal moderately enlarged, popliteal, retropharyngeal, bronchial, periportal, renal, serosal (stomach), mesenteric lymphglands moderately enlarged.

Peritoneal cavity contains about 1,000 c.c. of a slight blood stained almost clear liquid. Diaphragm nothing unusual. Pleural cavity nothing unusual.

Pericardial sac contains about 100 c.c. slightly blood stained almost clear liquid. Heart normal size and shape, epicardial fat moderately developed, epicard nothing unusual. Right ventricle in incomplete diastole, containing coagulated blood, endocard and valves nothing unusual. Left ventricle three-quarters systole, containing half coagulated blood. Ecchymoses under endocard. Myocard reddish brown. Consistency slightly decreased.

Spleen $35 \times 20 \times 3\frac{1}{2}$, capsule nothing unusual. Cut surface bulging, deep purple, granular. Trabeculae and Malpighian bodies not visible.

Nasal passages nothing unusual. Larynx nothing unusual. Trachae nothing unusual. Lungs: left in incomplete inspiration. Shape nothing unusual. Pleura smooth glistening and transparent. Colour of surface pink to light brick red. Large bronchi and vessels nothing unusual. Cut surface not prominent, varying in colour from pink to brick red. Small amount of frothy liquid scraped off. Consistency soft, elastic throughout.

Tongue nothing unusual. Pharynx nothing unusual. Oesophagus nothing unusual. Stomachs I-IV nothing unusual. Small intestine nothing unusual. Serosal vessels injected. Large intestine nothing unusual, serosal vessels injected.

Liver moderately enlarged. Capsule nothing unusual. Colour of surface purplish brown to plain brown with numerous not very distinct nor well defined brownish white spots, measuring 1 mm. across. Cut surface slightly prominent. Lobulation distinct. Fine red network in light red background. Fairly numerous spots like those on surface. Consistency normal. Pancreas nothing unusual. Salivary glands nothing unusual.

Kidney: pericapsular fat poor. Capsule easily removed. Colour of surface reddish brown with fairly numerous slightly lighter areas, irregular, and up to a few mm. across. Cut surface zones fairly distinct. Cortex brown. Intermediary zone purple. Medulla pink. Bladder nothing unusual. Thyroid nothing unusual. Suprarenal nothing unusual. Nervous system and skeleton nothing unusual.

Pathological Anatomical Diagnosis: Swelling of lymphglands, ascites, hydropericard, swelling of liver, subendocardial haemorrhages, tumor splenis.

Etiological Diagnosis: East Coast Fever.

BOVINE 539. TOLLY, 18 MONTHS.

Rigor mortis: present in mouth, absent in forelegs, present in hind legs. Condition fair. Visible mucous membranes: cornea opaque, conjunctiva yellowish white, mouth and anus normal. Blood watery, stains badly. Flesh opaque. Skin tick free, subcutis nothing unusual, moist. Superficial lymph-glands: prescapular gland enlarged, upon section edges everted. Mediastinal glands slightly enlarged, moist on section. Oral and aboral bronchial lymph-glands slightly enlarged. Subparotid and retropharyngeal lymphglands enlarged, moist, edges everted. Lumbar and internal inguinal lymphglands much enlarged and much firmer in consistency than normally.

Peritoneal cavity: amber coloured fluid escapes upon opening. Omentum and serosa moist. Situs viscerum nothing unusual. Diaphragm normally convex forwards. Pleural cavity: costal pleura shows from three to six slight rib areas of red colour, small quantity of clear red liquid in cavity. Bluish discoloration along dorsal vertebrae.

Pericardial sac contains 25 c.c. red stained liquid. Heart and large vessels: Right ventricle contains frothy blood. Right atrium dilated by well formed clot. Right atrio-ventricular orifice admits four fingers. Left ventricle contains little blood, left atrium a clot. Left atrio-ventricular valve admits three fingers with difficulty. Heart of normal size and shape. Epicard slaty blue, lymphatics prominent, fair amount of fat present. Right endocard and valves nothing unusual. Left heart shows red patches below endocard on musculi papillares and on septum. Myocard 3-1½ cm., nothing unusual. Coronary artery nothing unusual.

Spleen 32×18×4½, normal shape, capsule nothing unusual, on section pulp protrudes. Malpighian bodies distinct. Trabeculae not distinct, pulp not easily scraped off. Consistency firm.

Larynx: Mucous membrane bluish discoloured, otherwise nothing unusual. Lungs: not completely collapsed, elastic. Visceral pleurae light pink on both surfaces. Right lung, veins nothing unusual. Main bronchus mucous membrane slightly discoloured, froth in lumen. Artery intima pinkish. Left lung: vein nothing unusual, bronchus contains frothy liquid. On section moderate amount of froth scraped from cut surface, colour red, consistency elastic.

Mouth and tongue nothing unusual, muscle slightly moist. Pharynx mucous membrane bluish discoloured, contains mucous ingesta. Follicles red and distinct. Oesophagus contains ingesta. Stomach: adhesion between diaphragm and rumen. Abomasum contains normal ingesta. Mucous membrane pale, fundus portion greyish with irregularly placed red patches. Omasum: contents soft. Reticulum contains semi-liquid ingesta and some nails. Rumen contains soft ingesta, mucous membrane nothing unusual. Small intestine: mucous membrane blackish discoloured. Large intestine: colon contains yellowish mucoid floccules. Mucosa slightly swollen. Mucosa of caecum also blackish brown discoloured, mucous faecal contents present. Mesenteric glands nothing unusual. Rectum nothing unusual. Liver slightly swollen, edges rounded. Capsule nothing unusual. Colour of surface varies from orange to purplish blue. On section edges everted, yellow brown, lobulation not distinct. Watery liquid escapes on pressure, consistency firm. Gall bladder contains a viscous bile of brownish colour, semi-solid like glue. Pancreas nothing unusual.

Right kidney: fat capsule rich in fat. Fibrous capsule strips off easily. Surface shows a small white area raised, which, on section, enters into the cortex. On section cortex slightly pale, dirty, no details recognizable. Left kidney same as right. Bladder filled with a yellow gold urine, containing flakes. Thyroid is dark red and glistening. Adrenals: cortex slightly pigmented. Nervous system and skeleton nothing unusual.

Pathological Anatomical Diagnosis: Anaemia, swelling of lymphglands, ascites, swelling of liver, slight pulmonary oedema, endocardial haemorrhages, tumor splenis.

Etiological Diagnosis: East Coast Fever.

BOVINE 547. HELPER, 6 MONTHS.

Interim forty-five minutes. Rigor mortis absent. Condition fair. Conjunctiva brownish white. Mucosa of mouth bluish white. Blood half coagulated, staining well. Flesh light brown. Skin nothing unusual. Subcutaneous tissue nothing unusual. Superficial lymphglands: Right prescapular 7×2½×2, left 7×4×2½ cm., slightly enlarged. Right axillary 2½×1½×1. Left popliteal 2½×3½×1½, slightly enlarged. Left precrucal 5½×2 small, mediastinal enormously enlarged. Bronchial gland moderately enlarged, moist on cut surface, cortex grey, medulla light brown, grey. Retropharyngeal glands moderately enlarged, on cut surface moist, very pale.

Peritoneal cavity contains a small amount of a watery fluid. Peritoneum smooth, glistening and transparent. Diaphragm nothing unusual. Pleural cavity nothing unusual.

Pericardial sac nothing unusual. Heart normal size and shape. Epicardial fat fairly well developed, of normal appearance. Few deep red spots 5 mm. across, under epicard of left ventricle. Right ventricle empty, endocard shows numerous deep red spots measuring up to 3 mm. across, otherwise endocard and valves nothing unusual. Coronary vessels nothing unusual. Myocard: right 9, left 2, light brown, in places deep red spots up to few mm. across. Consistency nothing unusual. Spleen $35 \times 11\frac{1}{2} \times 2\frac{1}{2}$, enlarged, capsule nothing unusual. Cut surface edges everted, pulp deep purple brown. Malpighian bodies just visible. Trabeculae visible, pulp fairly easily scraped off. Consistency rather firm.

Nasal passages nothing unusual. Larynx mucosa pale. Lungs of normal size and shape, in incomplete expiration, pleura smooth, glistening and transparent, except in aboral half of diaphragmatic lobe where it is dull, colour of surface accordingly varies from light brownish red to bluish white, main bronchus nothing unusual, main vessels nothing unusual, on cut surface edges not everted, colour light yellowish brown, consistency soft elastic throughout.

Mouth and tongue nothing unusual, pale. Pharynx mucosa pale, nothing unusual. Oesophagus nothing unusual. Stomach, rumen filled with soft ingesta, mucosa nothing unusual, reticulum nothing unusual; omasum contains rather dry ingesta, mucosa nothing unusual, abomasum contains soft ingesta, mucosa pale. Small intestine contains soft ingesta yellowish in colour, mucosa pale. Caecum and colon nothing unusual. Mesenteric glands slightly enlarged, on section cortex enlarged, colour greyish brown. Rectum nothing unusual. Liver rather large, normal shape. Capsule nothing unusual, colour of surface varies from greyish purple to light purple brown and yellowish brown; cut surface: edges slightly everted, light purple brown with numerous ill-defined just visible spots, confluent in places to form an irregular network. Gall bladder contains about 100 c.c. of a dark green very viscid bile, mucosa nothing unusual. Pancreas nothing unusual. Salivary glands nothing unusual.

Kidneys: Right pericapsular fat tissue fairly well developed, of normal appearance, capsule easily detached, colour of surface, light brown with many pin-point sized spots of bright red colour, on section cortex not bulging, light brown, medulla light purple, pelvis nothing unusual, consistence normal. Left kidney, tissue on pelvis infiltrated with deep gelatinous material (apparently coagulated blood). Bladder: contracted, empty. Thyroid nothing unusual. Suprarenal gland nothing unusual. Brain nothing unusual. Bone marrow; humerus and femur nothing unusual.

Pathological Anatomical Diagnosis: Swelling of lymphglands, swelling of liver, small haemorrhages in kidneys, epicardial and endocardial haemorrhages, tumor splenis.

Etiological Diagnosis: East Coast Fever. Killed in extremis.

BOVINE 570. BULL, 1 YEAR.

Interim 3 hours. Rigor mortis present. Condition fair. Visible mucous membranes pale with yellow tinge. Eyes sunken. Blood partly coagulated, watery, stains badly. Subcutaneous tissue light yellow in colour. Superficial lymphglands: bronchial and mediastinal pale yellow and moist, submaxillary and pharyngeal much enlarged and firm in consistence, pale yellow in colour.

Peritoneal cavity: nothing unusual, serosa of stomach and intestines yellowish in colour. Diaphragm nothing unusual. Pleural cavity contains small amount of yellow-red clear fluid.

Pericardial sac 20 c.c. amber-coloured fluid, slightly turbid. Heart and large vessels: right ventricle and auricle contain coagulated blood. Right auricular opening admits four fingers. Left ventricle and auricle contain partly coagulated blood, ostium admits three fingers. Epicard shows numerous red spots of up to pin head size. Subendocardial vessels injected. Right endocard shows nothing unusual. Tricuspid valve shows slight yellow gelatinous infiltration. Left endocard shows a few red spots about the size of a pin's head below small semilunar valves. Coronary artery nothing unusual. Myocard: left 2.5, right 1. On section pale brown in colour, slightly opaque, consistency nothing unusual. Aorta nothing unusual. Spleen 47 by 16 by 4, capsule shows nothing unusual. On section trabeculae and Malpighian bodies distinct, pulp swollen, cut surface protrudes, consistency soft.

Nasal passages show nothing unusual. Larynx: mucosa over arytenoid cartilage dark bluish red and covered with a thin greenish fibrinous deposit. Trachea: vessels injected. Lungs: left lung partly inflated, pleura smooth;

apical, cardiac, and anterior portion of diaphragmatic lobe shows areas of atelectasis, these areas are dark bluish red, rather firm in consistency, and correspond to outlines of lobules. On section lung brick-red in colour. Consistency nothing unusual. Bronchi contain a small quantity of white foam. Right lung partly inflated, pleura smooth. Anterior and middle lobe show areas of atelectasis. Right lung similar to left. On section dark red; on pressure white foam exudes. Bronchus contains white foam and yellow fibrinous strings.

Mouth and tongue nothing unusual. Pharynx nothing unusual, bluish red. Oesophagus nothing unusual. Stomachs: rumen filled with ingesta, mucosa nothing unusual; reticulum nothing unusual; omasum nothing unusual; abomasum, mucosa slate coloured. Small intestines mucosa pale slate colour, last portion shows zebra markings. Caecum shows few small red patches. Colon nothing unusual. Rectum nothing unusual. Mesenteric glands moist, slightly enlarged. Liver: capsule nothing unusual, on section orange red colour. Lobulation distinct, interlobular vessels injected, consistency nothing unusual. Gall bladder contains dark green, thick viscid bile, mucosa nothing unusual. Pancreas pale yellowish brown and moist. Salivary glands pale and moist.

Kidney: fat capsule yellow, fibrous capsule easily detached. Cortex shows numerous red pin-point spots. On section cortex and medulla pale brown in colour. Glomeruli not distinct, slightly opaque, consistency nothing unusual. Suprarenal: medulla shows bluish red areas of about pin-head size. Brain nothing unusual. Skeleton: bone marrow, humerus, and femur nothing unusual.

Pathological Anatomical Diagnosis: general icterus, swelling of lymph-glands, pigmentation of liver, slight pulmonary oedema, aspiration of blood, hydropericard, epicardial and endocardial haemorrhages, tumor splenis.

Etiological Diagnosis: East Coast Fever.

BOVINE 607. MALE, 8 MONTHS.

Interim 1 hour. Rigor mortis absent. Condition fair. Abdomen sunken. Skin of right ear partly torn off leaving a red surface. All mucous membranes moderately bluish discoloured. Blood well coagulated and well staining. Flesh shows nothing unusual. Subcutaneous tissue more moist than normal especially on head, neck, and thorax. Prescapular and precrural lymphglands moderately enlarged, on section the cortex greyish, medulla deep blue.

Peritoneal cavity: organs in position, serosa blue, otherwise nothing unusual. Diaphragm convex forwards, bluish discoloured. Salivary glands and thyroids show nothing unusual. Submaxillary, retropharyngeal and upper cervical lymphglands enlarged. Cortex pale grey, medulla blue. Mediastinal lymphglands enlarged. Bronchial lymphglands enlarged.

Pericardium shows blue discoloration. Heart of normal size and shape, epicardial fat tissue well developed. Both endocards and all valves are bluish discoloured. Right myocard .9, left 3 cm. thick. On section pale brown, slightly opaque and of normal consistency.

Spleen measures $11 \times 38 \times 2.5$ cm., on section the edges are straight, the cut surface has a wine red colour, trabeculae are distinct, Malpighian bodies just visible in places but small, consistence normal.

Oesophagus, larynx, and trachea show bluish mucosa. In the lung there is some white foam. Lungs: left incompletely deflated. Pleura bluish, otherwise of normal appearance, colour of surface varies from light greenish brown to blue. The main bronchus contains a moderate amount of yellow froth mixed with fibrinous strings, mucosa bluish. Vessels show nothing unusual. On section the edges are bulging. A fair amount of brown froth can be scraped off, cut surface mottled, light yellowish apparently air containing lobules are separated by a network of narrow reddish streaks, consistence soft and elastic. Right lung as left.

Tongue on surface and cut surface bluish discoloured, otherwise nothing unusual. Pharynx: mucosa bluish discoloured. The tonsils are enlarged. On section the follicles stand out as pale grey foci on a blue background. Rumen contains soft ingesta, mucosa bluish. Reticulum and omasum contain ingesta of normal appearance, mucosa bluish. Abomasum contains soft ingesta, mucosa blue. Small intestine contains semi-liquid ingesta of yellow colour, mucosa moderately swollen and reddened. Peyer's plaques well visible, enlarged. Large intestine: about three yards from the ileo-caecal opening, the mucosa shows a deep red spot, 1 cm. in diameter; two similar spots are present in the ileum: the mucosa of caecum and colon is swollen, and shows red ramification on blue background. Mesenteric lymphglands enlarged, cortex reddish brown to greyish, medulla deep blue.

Periportal lymphglands swollen, cortex is bluish grey and shows a few injected vessels, medulla blue. Liver slightly enlarged, edges rounded, the capsule is slightly bluish discoloured. The surface is purplish grey and shows some deep red spots up to 1 mm. in diameter. On section the edges are bulging, fair amount of blood flows off. The cut surface has a marbled appearance, the centres of the lobuli appear deep green, consistence friable. Gall bladder contains 100 c.c. of a deep green, slightly viscid bile, mucosa shows nothing unusual. Pancreas slightly bluish discoloured, otherwise nothing unusual.

Adrenal glands bluish discoloured. Kidneys: fat capsule moderately developed, in places infiltrated with a yellow gelatinous material, fibrous capsule easily detached, colour of surface varies from bluish grey to green, on section edges appear straight, cortex green, intermediary zone shows red radial striation. The cortex contains a focus of pea size, which does not reach the surface, with a pale yellowish centre and a reddish periphery. The focus has the consistence of kidney tissue. Medulla bluish green, consistence normal. Bladder contains about two litres of deep orange-coloured, almost clear urine, mucosa shows nothing unusual. Brain: choroid plexus bluish discoloured, otherwise nothing unusual. Bone marrow of humerus and femur fatty. Nasal passages contain froth and mucus, mucosa is bluish discoloured.

Pathological Anatomical Diagnosis: bluish discoloration of various tissues due to intravital trypan blue stain. Enlargement of all lymphglands, bile stasis in liver, slight pulmonary oedema, gastro-intestinal catarrh.

Etiological Diagnosis: East Coast Fever, killed in extremis.

BOVINE 616. FEMALE 1½ YEAR.

Interim 1 hour. Rigor mortis absent. Condition good. Abdomen and integument show nothing unusual. Mucosa of vagina and anus pale pink. Watery discharge from nostrils. Mucosa of mouth pale pink. Blood coagulated, staining well. Flesh and subcutaneous tissue show nothing unusual.

Peritoneal cavity shows nothing unusual. Omentum contains a large amount of normal fat tissue. Diaphragm shows a few fibrous filaments on both surfaces. Pleural cavities show nothing unusual.

Salivary glands and thyroid show nothing unusual. Lymphatic glands: fibrous tissue around the left prescapular gland is infiltrated with a blood-stained partly coagulated fluid. The gland itself is enlarged (7.5×3.5×1.5 cm.) on section the cortex appears greyish, medulla pink. Right prescapular gland measures 8×3×2 cm., on section the cortex is grey, the medulla bright red, consistency slightly increased. Right precrucial lymphgland 5.5×3×1.5 cm., left popliteal lymphgland 3.5×3×1.3 cm., section and consistence as the other glands. Right axial lymphgland measures 1×1½×½ cm.

Pericardial sac shows nothing unusual. Epicardium shows a few red spots up to 1 mm. in diameter. Fat tissue well developed and of normal appearance. Right ventricle flabby, left contracted, both empty. Endocard and valves show nothing unusual. Right myocard 1.3 cm., left 2 cm., section transparent, reddish brown, and of normal consistence. Coronary arteries show nothing unusual.

Spleen 36×12×3 cm., edges sharp, capsule shows nothing unusual, on section the edges are bulging, trabeculae and Malpighian bodies distinct, pulp grey-reddish-brown, consistence normal.

Larynx and trachea show nothing unusual. Lungs: left lung inflated, pleura smooth, glistening, and transparent. Colour of surface varies from light brown to purplish grey. Under the pleura there is a moderate number of deep purplish, well defined spots measuring up to 1 cm. in diameter. On section these foci extend into the parenchyma for up to half a centimeter. Main bronchus of main lobe empty, mucosa pale, main vessels show nothing unusual. On section the edges appear inverted, a small amount of slightly blood-stained froth can be scraped off, the colour of the cut surface varies from light pink to purplish red. Consistence soft and elastic. Right lung appears paler on surface and cut surface, otherwise as the left. Bronchial lymphglands moist and moderately enlarged, cortex grey; mediastinal lymphglands moderately enlarged.

Tongue, pharynx, and oesophagus show nothing unusual. Retropharyngeal lymphglands moderately enlarged. Rumen: serosa shows nothing unusual, contents of normal appearance, mucosa shows nothing unusual. Reticulum shows nothing unusual. Omasum shows nothing unusual, contents moderately dry. Abomasum: ingesta soft, mucosa of a light pinkish grey colour. Small intestine: mucosa swollen and reddened, in patches as zebra markings. These

changes extend through the whole of the mucosa. The contents are semi-liquid, green, and mixed with grey mucus. Caecum contains soft ingesta, the mucosa shows a patchy reddening which is less extensive than that of the mucosa of the small intestine. Colon: first forty cm. show nothing unusual, in the following metre the mucosa is reddened and swollen. These changes become less pronounced towards the rectum. Rectum contains faeces of normal appearance; in the mucosa there is a moderate number of deep red spots $\frac{1}{2}$ mm. in diameter. Mesenteric glands not distinctly enlarged but discoloured as the others. Mesentery rich in fat tissue, of normal appearance. Periaortal lymphglands enlarged, on cut surface light grey. Liver: large, the capsule shows a number of fibrous filaments on the diaphragmatic surface of the middle lobe, the capsule is thickened in an area, the size of a penny; on section into this a pea-size cavity is detected underneath the capsule, filled with a light grey caseous material and surrounded by a zone of 4 mm. thickness, formed by a firm, pale brown tissue; colour of surface reddish brown. On section the edges appear straight. A small amount of a bloody liquid can be scraped off, the cut surface is diffuse reddish brown, lobulation not distinct, consistence friable.

Adrenals show nothing unusual. Kidneys: fat capsule normal, fibrous capsule easily detached, surface reddish brown. On section the edges are straight, zones distinct, cortex light purplish grey, consistence normal. Left as right, no macroscopical foci present. Bladder half contracted, contains 100 c.c. of reddish urine, mucosa contains a moderate number of red pin-point spots otherwise nothing unusual. Uterus: empty, on the serosa a moderate number of red pin-point spots, mucosa shows nothing unusual. In the ovaries a few cysts present, containing a watery liquid. Vagina shows nothing unusual. Brain shows nothing unusual. Nasal passages show nothing unusual. Bone marrow of humerus and femur fatty.

Pathological Anatomical Diagnosis: anaemia due to bleeding immediately before post mortem, encapsulated abscess in liver, moderate tumor splenis with enlargement of Malpighian bodies, gastro-enteritis, moderate swellings of lymphglands.

Etiological Diagnosis: Killed in narcosis. (East Coast Fever Experiment.)

BOVINE 673. Ox 1½ YEARS.

Interim 3 hours. Rigor mortis setting in in mouth. Condition fair. Integument shows nothing unusual. Conjunctiva pale and moist, eyes sunken, mucosa of nostrils and mouth of a dirty bluish, pale colour. Blood-stained liquid oozes from the anus. Blood from axillary vein, dark in colour, well staining, not coagulated. Flesh pale and transparent. Subcutaneous tissue moist, poor in fat.

Peritoneal cavity: situs viscerum normal, contains a fair amount of a clear, slightly blood-stained fluid. Serosa glistening, numerous fibrous filaments on rumen. Diaphragm opposite 6th rib shows nothing unusual. Left pleural cavity contains two hundred c.c. of a clear, amber-coloured fluid. Costal pleura smooth and glistening. Right as left. Salivary glands and thyroids show nothing unusual. Lymphglands all swollen. Submaxillary gland is about four times its normal size. On section it is of a reddish brown colour. Retropharyngeal lymphglands slightly swollen. Upper cervical and prescapular lymphglands enlarged. Oral bronchial lymphgland swollen, on section moist, the aboral bronchial lymphglands swollen, on section these show small, dark red foci.

Pericardium poor in fat, the sac contains about 70 c.c. of a clear, amber-coloured fluid. Epicardium contains a small amount of fat. Right ventricle empty, left contains a small amount of uncoagulated blood. Right endocard pale, left contains a few haemorrhages up to 1 cm. in diameter, and extending into the myocard for up to 5 mm. Valves show nothing unusual. Left myocard 1 cm., right $\frac{1}{2}$ cm., on section it appears opaque, consistence friable. Coronary vessels show nothing unusual.

Spleen measures 48×16×4 cm., the capsule is smooth and glistening, of a purplish grey colour, borders rounded, on section edges everted. Malpighian bodies much enlarged, trabeculae partly hidden, pulp soft.

Larynx and trachea: mucosa pale, fair amount of white froth in lumen. Lungs: left incompletely deflated, pleura normal, colour of surface varies from grey to purple, on section the edges are bulging, large amount of froth flows off. Interstitium is infiltrated with a yellowish transparent fluid, the parenchyma appears deep red. Main bronchus contains a large amount of blood-stained froth, mucosa pale. Main vessels show nothing unusual. Consistency slightly increased. Right as left.

Tongue, pharynx, and oesophagus show nothing unusual. Rumen, reticulum and omasum show nothing unusual, in omasum the ingesta is soft and moist. Abomasum: semi-liquid contents, the mucosa is slightly diffusely reddened and more markedly so in scattered patches. Duodenum: mucosa reddened and covered with a greyish mucus. Jejunum and ileum: Peyer's patches not distinct. Large intestine: mucosa shows nothing unusual. The small colon contains a few specimens of *Oesophagostomum radiatum*, embedded in reddish brown soft ingesta. Mesenteric lymphglands enlarged, on section moist, cortex opaque, medulla dark grey. Mesentery contains a normal amount of fat tissue.

Periportal lymphglands slightly enlarged, cortex greyish. Liver much enlarged, the edges appear rounded. Capsule smooth, glistening, and transparent, colour of surface purplish, on section edges everted, a large amount of blood escapes, lobulation not distinct, central veins can be made out in places, consistence friable. Gall bladder distended with greenish black bile. Pancreas of normal size and shape.

Adrenal glands show nothing unusual. Kidney: fat capsule fairly well developed. Fibrous capsule, easily removed, leaving a smooth surface of brownish red colour. On section zones not distinct, colour purplish, consistence firm. Bladder contains a straw-coloured, clear urine, mucosa shows a few deep red pin-point spots. Sexual organs show nothing unusual. Brain shows nothing unusual.

Pathological Anatomical Diagnosis: enlargement of all lymphglands, slight ascites, moderate hydrothorax, slight hydropericardium, degeneration of myocard, haemorrhages under left endocard, hyperaemia and oedema of lungs, tumor splenis, stasis liver, acute catarrh of small intestine, *Oesophagostomum radiatum* adults in colon, haemorrhagic colitis.

Etiological Diagnosis: East Coast Fever (acute experimental case).

BOVINE 681. OX, 1½ YEARS.

Interim 1 hour. Rigor mortis absent. Condition fair. Abdomen and integument show nothing unusual. Conjunctiva and all other mucous membranes show a bright pink discoloration (due to the intravital carmine stain). Blood well coagulated and well staining. Flesh on neck and shoulder moist, and brownish red. Subcutaneous tissue on ventral surface of head and neck infiltrated with a yellowish transparent jellylike material. On left side of neck a fair amount of coagulated blood in the subcutis. Bloody serous infiltration, also around both prescapular lymphglands.

Peritoneal cavity, diaphragm, pleural cavities, salivary glands and thyroids show nothing unusual. Submaxillary gland much enlarged, on cut surface bright carmine red. The left one measures 8.5×6.5×2.5 cm. Retro-pharyngeal, upper and lower cervical lymphglands much enlarged, reddened on cut surface, the prescapular lymphgland measures 7×4×2. Mediastinal lymphglands enlarged. Left precural lymphgland measures 3.5×6.5×1.3 cm. Left popliteal lymphgland measures 3.5×3.5×1.5 cm.

Pericardium shows nothing unusual. Epicardium: fat tissues well developed, pink discoloration of the serosa. Right ventricle in diastole, left ventricle in systole. Atria shows nothing unusual. The endocard shows a slight carmine discoloration. The valves show nothing unusual. Myocardium is of a light brown colour, firm, right 1.2, left 2.5 cm. thick. Coronary arteries show nothing unusual.

Spleen: large, 40×14×3 cm. Capsule nothing unusual. On section the edges are bulging. Trabeculae visible. Malpighian bodies enlarged, giving the cut surface a granular appearance. Pulp deep red, soft.

Tongue, pharynx, oesophagus, larynx, trachea show nothing unusual. Lungs deflated, pleura show nothing unusual. The colour of the surface varies from pink to pinkish grey. Main bronchus and vessels show nothing unusual. On section the edges are inverted. A small amount of blood-stained froth can be scraped off. The colour varies from pink to purple. Consistence is soft and elastic throughout. Rumen is filled with food and much liquid, mucosa shows nothing unusual. Reticulum and omasum contain soft ingesta, the mucous membranes show nothing unusual. Abomasum contains semi-liquid ingesta, the mucosa is deep carmine red. Small intestines contain semi-liquid ingesta of a brownish colour. The mucosa is swollen and much reddened. Large intestine contains soft ingesta of normal colour, mucosa pink. Mesenteric lymphglands enlarged. On section cortex grey red. Mesentery shows nothing unusual. Periportal lymphglands much enlarged, on section cut

surface carmine red. Liver large, capsule nothing unusual, surface brown red. On section structure not distinct. Colour diffuse purplish red. Consistence not friable. Pancreas shows nothing unusual, except for pink discoloration.

Suprarenal glands show nothing unusual. Kidneys: perirenal fat tissue well developed. Capsule strips easily. Colour of surface brownish pink. No foci present. On section edges straight, zones distinct, all pinkish discoloured. Bladder shows a fair amount of reddish urine, mucosa shows nothing unusual. Sexual organs show nothing unusual. Nervous system shows nothing unusual. Bone marrow of humerus and femur, fatty.

Pathological Anatomical Diagnosis: marked discoloration of all organs due to carmine stain, marked swelling of lymphglands, tumor splenis, swelling of liver.

Etiological Diagnosis: Killed in *extremis* (East Coast Fever).

VI.—REFERENCES.

- (1) Knuth and Du Toit. "Tropenkrankheiten der Haustiere." Mense's handbook, Vol. 6, Leipzig Barth. 1921.
- (2) Gray and Robertson. *Vet. Journ.* 7, 1903, p. 219.
- (3) Koch, R. *Journal of Comparative Pathology*, 1903, p. 275.
- (4) Collaud. Diss. Zürich 1906.
- (5) Mayer, M. "Archiv für Schiffs und Tropen-hygiene" 14, Beiheft 7, 1910.
- (6) Meyer, K. F. Report of the Government Veterinary Bacteriologist, Transvaal, 1910.
- (7) Idem. *Centralblatt für Bacteriologie.* O.I.57, 1911, p. 145.
- (8) Idem. "Afrikanisches Küstenfieber" in Handbuch der pathog. Mikroorganismen—Kolle and Wasserman. 2 ed. 1913. Jena-Fisher.
- (9) Carpano. Piroplasmosi tipo "parvum" nei bovini del basso bacino del Mediterraneo. *Clinica Veterinaria*, 1915.
- (10) Heuschen. Diseases of the Kidney in Joest Special Pathological Anatomy, Vol. 3, Berlin. Schoetz, 1923.