EXPERIMENTAL EAST COAST FEVER.

A STUDY OF CLINICAL SIGNS, HAEMATOLOGY AND BIOCHEMISTRY.

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DECLARATION:

This thesis is my original work and has not been presented in any other University.

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S U M M A R Y :

In East Africa today, the tick borne diseases continue to be the major problem to contend with, for bovine meat and milk production. Of these diseases, East Coast Fever is the least manageable due to its widespread distribution, lack of effective vaccine and cure and usually fatal results to the host. Inspite of dipping procedures and some progress in the direction vaccine production, the prevailing conclusion is that East Coast Fever will be a problem for some years to come. Consequently, a more detailed understanding of this disease appears to be needed, especially in the light of the apparent existence of several strains.

In the areas of diagnosis, treatment, control, and research, it would seem imperative that stages of the infection could be consistently recognized for example, in the area of treatment early diagnosis enhances efficacy, making the importance of reliable clinical signs or laboratory tests obvious.

Because there are apparently more than one strains of Theileria parva as well as other Theilerial species which can contribute to theileriosis in cattle, it would be necessary to rather well define the clinical signs of known infections, thus better enabling field diagnosis and control of recognised strains as well as new ones.

Three strains of Theileria were used in this research. Two of the strains, Theileria parva (Aitong) and Theileria

parva (Kiambu) were recently isolated from cattle infected with East Coast Fever. Theileria parva (Muguga) was adopted as the laboratory strain whose incubation and reaction periods and mortality rates had earlier been defined. Theileria parva (Aitong) was isolated from cattle sick with East Coast Fever in Aitong in Narok District of Kenya. Its transmission studies had revealed pronounced anemia in the infected animals. Theileria parva (Kiambu) was isolated from sick cattle in Kiambu District of Kenya.

Infections were done using stabilates which were suspensions of the parasites prepared from infected ticks. These stabilates were stored in deep freeze and thawed when required for infecting animals.

Bull calves 8-12 months old, of various exotic breeds were used. These calves were bought from farms with rigorous tick control and were further tested for any possible East Coast Fever exposure with Indirect Fluorescent Antibody test using schizont antigen. Calves with titres above I:IO were not used. The animals were bought in a reasonably healthy condition. Infected calves were evaluated using clinical examination haematology and serum biochemistry.

Theileria parva (Kiambu) proved to be a mild strain causing only 20% mortality in infected calves. Theileria parva (Aitong) produced an acute disease indistinguishable

from Theileria parva (Muguga) infection. I:IO dilution of the stabilate of the latter strain gave a mild disease with 40% mortality in infected calves. Though Theileria parva (Muguga) has been maintained under laboratory conditions for over ten years, it showed a high virulence killing all the infected cattle.

Clinical signs observed with the strains ranged from those of acute, subacute, mild and inapparent infections. In the acute East Coast Fever, there was enlargement of the lymph node, regional to the site of infection, before temperature elevation. After thermal reaction, the calves became dull with staring coats. Other signs were seen later in the course of the disease (mostly 5 days post-temperature rise). These were decreased appetite, increased nasal discharge and hypersalivation and enlargement of other peripheral lymph nodes which regressed in prolonged disease course. Respiratory and pulse rates were increased and a cough which was originally dry became moist and more distressed terminally. An edematous swelling involving mostly the side of inoculation on the head was recorded. There was petechiation of the mucous membranes. The calves lost condition and few calves which reacted longer became emaciated. They became weak, inco-ordinated and were recumbent terminally. Corneal opacity was recorded in one calf. Shivering and grinding of teeth was a common finding. Diarrhea was terminal occurring within the last five days and in some calves it was mixed with blood. Dyspnea was marked before the calves died and most calves died with

Subacute disease had the signs of the acute disease but temperature reaction period was long and ended in recovery. Mild infection was characterised by slight temperature elevation for a few days, enlargement of lymph nodes, dullness and staring coats. Some calves with the mild disease exhibited fever remission. Inapparent infection was only detected by the presence of macroschizonts in the regional lymph node.

Panleukopenia was observed in all calves which became visibly sick. The leukopenia was mild and reversed in recovering calves but progressive in dying animals. Calves whose leukocyte count dropped below two thousand cells died of the infection.

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INTRODUCTION

East Coast Fever is a disease of cattle caused by Theileria parva (Theiler 1904). It is widespread in Eastern Africa (Wilde 1967) in areas with climates suitable to the tick Rhipicephalus appendiculatus which is the vector (Wilde 1967). In susceptible cattle, morbidity and mortality rates are very high (Brocklesby et. al. 1961). These may approach 88% and 96% respectively. It is one of the most important diseases retarding the expansion of cattle trade in East Africa (FAO Report 1957).

No satisfactory cure of the patent disease has yet been found. By injecting large doses of Chlortetracycline intravenously throughout the incubation period, Neitz (1953) modified the course of the disease with recovery of the infected animals. Barnett (1956) demonstrated that Aurofac a by-product of Chlortetracycline had a similar effect. Oxytetracycline has the same effect (Neitz 1957). Neitz (1950) had shown that plasmoquine had a selective action on haemotropic forms of Theileria parva but did not affect the schizont phase. It is therefore clear that there is no cure for the clinical disease. Use of tetracyclines during the incubation period is both expensive and impractical under the field conditions where the disease is only reported when in advanced stage. In claiming success in treatment of East Coast Fever, one should remember the small percentage which recover and the existence of mild

strains of Theileria parva described by Barnett et. al. (1961 and 1966).

Animals recovering from East Coast Fever gain a sterile immunity (du Toit 1931; Neitz 1948 and Barnett and Bailey 1955b). Vaccination trials have been tried using (1) irradiated parasites (Cunningham et. al. 1971), (2) Theileria parva schizonts grown in cell culture (Brown et. al. 1971). (3) Infection and treatment (Jarret et. al. 1969). None of the methods mentioned have proved both safe and economic for use in mass vaccinations.

Due to lack of effective cure and vaccine, a veterinarian in the field is usually forced to recommend slaughter of the proven cases of East Coast Fever regardless of the small percentage of survivals. In this research, an attempt has been made to provide a prognosis by considering clinical signs, haematology and biochemical changes in Theileria parva infections in both acute and mild disease. Utilising the quantum of infection hypothesis put forward by Wilde et. al. (1968) and supported by Cunning et. al. (1970), a titrated dose of stabilate was used to induce mild infection with some survivals thereby allowing observation of the changes in dying and recovering animals.

A need has also been expressed to try and define the clinical signs of Theileria parva (muguga). This is a laboratory strain which has been maintained between ticks

and susceptible cattle for over ten years (Brocklesby et al. 1961). Fever reactions and incubation periods of this strain are defined (Brocklesby 1962). In this work, Theileria parva (aitong) (Edinburgh University East African Veterinary Expendition 1970) a recently isolated strain of Theileria parva was considered for comparison purposes. According to Snodgrass et al. (1972) Theileria parva (aitong) caused anemia which developed and progressed as theilerial parasitaemia increased. With occasional notable exceptions (Neitz 1948 and Wilde et al. 1968), classical Theileria parva infection does not cause anemia (Henning 1956 and Wilde 1967). This Aitong strain therefore provided a very interesting comparison with Theileria parva (muguga).

After a preliminary experiment with Theileria parva (aitong) stabilate 20 and Theileria parva (muguga) stabilate 21, these stabilates lost viability due to power failure which forced the temperature in "Revco" deep freeze to go up. Another Theileria parva (muguga) stabilate 44 was adopted. Theileria parva (Kiambu) was introduced as a field strain. The latter was isolated from ticks picked from cattle infected with East Coast Fever in Kiambu District of Kenya.

LITERATURE REVIEW:

HAEMATOLOGY:

The most significant and consistent haematologic change in East Coast Fever (Theileria parva infection) is leukopenia. This has been observed by several workers (Strickland 1916, Steck 1928, Wilde 1963, Brown et. al. 1965, Wilde 1967 and Munyua W.K. 1971). Wilde (1963) observed that leukocyte levels returned to normal levels in recovering cases. If leukopenia was extreme, the animals failed to recover. The latter observation was made by Steck (1928). He attributed the leukopenia to a decrease in both lymphocytes and neutrophils. Wilde's work (1963) supports Steck's finding and further observed that Neutorphils disappeared faster than the lymphocytes. This, he thought was because Neutrophils were fewer in number than lymphocytes and therefore tended to disappear from the circulation quicker than the latter so that in fatal disease all remaining leukocytes were lymphocytes. Wilde (1966a) in his work on changes in bone marrow ascribes the leukopenia to maturation arrest of the granulocytic series so that there was a shift to the left. Barnett (1960) noted that leukopenia commenced 2-7 days (Average 4 days) after onset of Fever. The reduction in leukocytes was proportional to the degree of parasitaemia and fever. When leukocyte count reached 1000 cells/cmm. of blood, the animal died within

1 - 2 days. He observed an occasional terminal leukocytosis.

Anemia has been described as insignificant feature (Henning, 1956, Wilde 1967). Notable exceptions are the findings of Neitz (1948) and Wilde et. al. (1968). The latter observed a P.C.V. of 9% in an animal with 90% piroplasm parasitaemia. Brown et. al. (1965) observed that there was a slight decline in total Red blood cells in cattle with the a prolonged disease course. Both haematocrit and haemoglobin levels followed the erythrocyte pattern so that MCV and MCHC were unchanged. This finding is supported by Munyua (1971). Theileria parva (aitong) (Edinburgh University, East African Veterinary Expendition 1970), seems to cause a pronounced anemia (Snodgrass et. al. 1972, Irvin et. al. 1972). Enigma surrounds this strain as it was isolated from cattle infected with both T. mutans and Theileria parva (aitong) (Irvin et. al. 1972). This strain had cross-immunit with Theileria parva (muguga).

A definite and pronounced thrombocytopenia was observed by Wilde et. al. (1965) in infections with Theileria parva (muguga).

According to Barnett (1960) macroschizonts were found three days after enlargement of the local drainage lymph node of tick attachment. The number of these parasites reached maximum 6-9 days after node enlargement.

Macroschizonts were demonstrable in other peripheral lymph nodes and usually on 1st day of febrile reaction. The macroschizonts increased steadily with progress of the disease towards death. Jarret et. al. (1969) recorded that between 11-20 days after infection macroschizonts increased ten-fold every 3 days. Studies of Radley (1970) seem to contradict this growth rate. He argues that if fewer numbers of infective particles are inoculated, the host is able to exert an effect on the parasite which causes a slowing down of the parasite's replication rate. Even smaller numbers of infective particles would result in recovery of the animals.

BIOCHEMISTRY:

There is very little research done on chemical pathology of East Coast Fever. Roets (1943) determined serum bilirubin and coproporphyrin in urine and faeces in Theileria parva infection. There was a bilirubinaemia and coproporphyrin concentration increased in both urine and faeces. He thought the increase in the latter could be due to decrease in amount of faeces passed. Schindler et. al. (1968) when doing serological studies of Theileria parva infection of cattle found that there were raised concentrations of bilirubin, serum glutamate - oxalate transminase and lactate dehydrogenase (L.D.H.). α_2 and β globulin levels were also elevated. Munyua (1971) recorded slight elevation in SGOT and no change in serum

glutamate pyruvate transminase (SGPT). Barnett et. al. (unpublished work) report a significant fall in serum calcium and magnesium levels as disease progressed. There was a fall in serum inorganic phosphate which in some cases rose back to normal just before death. Total serum protein levels varied between the infected animals but it is noteworthy that in four of six animals used, there was a decrease in serum protein mainly caused by a decrease in serum globulin. Serum alkaline phosphatase (A.P.) showed no significant trend while positive indirect Van den Bergh reactions were recorded in sera of three animals, three and two days before death. It is to be noted however that Barnett et. al. used only six animals for analysis. This number of animals may be statistically insignificant.

CLINICAL SIGNS:

Dixon (1910) claimed that a marked fever was the first evidence of disease, followed by depression, drooping ears and head, salivation and running eyes. Initially constipation was observed followed by a shiny often blood tinged diarrhea. Lung involvement caused distressed breathing and a short cough. Lymphadenopathy was reported to occur sometimes. Prior to death, the animals demonstrated signs of delirium or were comatose. He reported the incubation period to be ten days, and a disease course of approximately 25 days until death.

Henning (1956) puts incubation period as being 10-15 days in majority of cases but may be as long as 25 days. He claims that the first indication of infection is a rise of temperature (106-108°F). Clinical signs appear few days after temperature rise. Appetite is gradually lost, rumination ceases, the coat is staring, cessation of milk secretion, excessive salivation and lacrymation, the muzzle becomes dry and ears droop. He claimed that swelling of superficial lymph nodes is characteristic of the disease. The breathing becomes distressed and short cough develops. There may be constipation but diarrhea is much more common, the faeces being slimy, blood tinged and sometimes tar-like. Diarrhea is more marked from eighth to tenth day. Jaundice, anemia and haemoglobinuria only occur due to secondary complications with Babesia bigemina and Anaplasma marginale.

As disease advances the superficial lymph nodes become larger. The animal becomes weak, emaciated, dull and depressed. Distressed breathing occurs when pulmonary edema develops. The animal is then liable to die suddenly due to asphyxia. Large amounts of froth may exude from the nostrils at time of death.

Some animals suffer from progressive weakness of hindquarters and are forced to become recumbent at an early stage. The animal then becomes delirious and

comatose before death. The animal generally loses condition but sometimes it keeps on feeding for some time so that the loss in condition may not be evident.

The animal may last 10-12 days after temperature rise. With the South African Strain of Theileria parva morbidity may be hundred percent with mortality approximating 95%. He claims that in East Africa where the disease is endemic, mild cases are often encountered and recoveries more frequent.

Neitz (1957) describes the disease as occuring in acute, subacute, mild and inapparent forms. He describes the acute form as the commonest naturally occurring form and usually terminates fatally. A persistent high fever (106-107°F) was present for 5-7 days followed by occasional normal temperature and return to marked fever. Clinical signs observed included: inappetance, cessation of rumination, serous nasal discharge, lacrimation with variable swelling of superficial lymph nodes, rapid pulse, decreased milk production and general weakness. Faeces are firm at the beginning of pyrexia but diarrhea usually commences in six to eight days after temperature rise. The evacuations are frequently mixed with blood and mucus. The animal becomes markedly emaciated, recumbent and often coughs. Respiration becomes accelerated and dyspnea is marked shortly before death. A variable amount of froth exudes from the nostrils. Disease course is 8-25 days (Average 15 days).

Neitz claims that the subacute form is often encountered in calves and to a lesser extent in adult stock in enzootic regions of East Africa. It has also been observed in partially immune animals and artificially infected cattle. The symptoms resemble those of acute form but less pronounced. The fever may either be continous or irregularly intermittent, persisting for 5-10 days. Animals usually recover from this form but may take several weeks before they regain their former condition.

The mild form described by Neitz consisted of mild fever persisting for 3-7 days. There is listlessness and swelling of peripheral lymph nodes. It is seen in animals which are partially immune and artificially infected. Few macroschizonts are encountered in gland smears and in blood smears relatively small number of piroplasm are seen.

The inapparent form is induced by inoculation of the animal with infected blood or emulsions of organs from an infected animal.

The report in East African Agricultural Journal 1947 supports the foregoing descriptions of clinical signs of East Coast Fever. It also notes that clinical signs appear later in the disease course. The report adds that in some cases corneal opacity is observed and

blindness may ensue. The sick animal continues to feed until the disease is well advanced. It reports a high mortality in susceptible animals introduced into infected areas. Outbreaks in clean areas may sometimes have a high rate of recoveries.

Brocklesby (1962) found the incubation period to vary between ten and seventeen days and the febrile period lasted from seven to eighteen days. Remission of fevers occurred in 12% of the cases. Maximum temperature reaction varied between 103.6°F to 108°F with an average of 105°F. Brocklesby et. al. (1961) found that mortality and morbidity rates in East Coast Fever (Theileria parva infection) were 95.5% and 87.5% respectively.

Mild infections have been reported by Barnett et. al. (1961, 1966). In 1961 during their field vector studies of Theileria lawrencei, they collected Rhipicephalus appendiculatus ticks which when applied to susceptible cattle produced a mortality of 23%. They also noted that mortality rate depended on number of infected ticks attached to an animal. They sound a word of warning to veterinarians on reported therapeutic cures. In 1966, the same authors isolated a mild strain of Theileria parva from an unknown wild animal. Mortality rate was 25% and this was related to number of ticks attached. They also observed a persistence of infection

in the blood of recovered cattle. They suggested that such mild strains accounted for the alleged successful treatments of the Theileria parva infections in the field. They also observed that the persistence of infection may explain sporadic cases of East Coast Fever in areas thought to be clean.

MATERIALS AND METHODS

EXPERIMENTAL CATTLE:

Bull calves of exotic breeds were used in all experiments. They were between seven and twelve months of age. Their body weights, especially for the infected group, was always more than 250 lbs. They were bought from farms supposed to be free from East Coast Fever and therefore, were assumed to be reasonably susceptible to East Coast Fever infection. No test was applied to the calves in the preliminary experiments to check their susceptibility to East Coast Fever but in the subsequent experiments all calves were tested for East Coast Fever by I.F.A. test (Burridge and Kimber, 1972) using schizont antigen. Calves which showed I.F.A. titres higher than 1:10 were not used in the experiments.

All calves used in the experiments were in good health. Before being brought in, they were examined for health by checking temperatures, pulse and respiratory rates. They were also in good condition when being bought.

The calves were checked for patent Babesiosis and Anaplasmosis infections by examination for Babesia and Anaplasma parasites. This was done for at least one week before the inoculation with Theileria parva parasites.

E X P E R I M E N T A L W O R K

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The calves were checked for patent Babesiosis and Anaplasmosis infections by examination for Babesia and Anaplasma parasites. This was done for at least one week before the inoculation with Theileria parva parasites.

Faecal samples from the calves were examined for gastrointestinal parasites. Those with, even low egg count, were treated with Nilverm. Calves with liver fluke infection were not used.

Calves were kept for at least one week before being infected with Theileria parva. This was meant to get them adopted to the stall environment and especially to the food which they were to eat throughout the experiment. These calves were mainly fed with hay supplemented with bran and dairy cubes. Water and salt were given ad lib.

These calves were kept clear of ticks by spraying them with Toxaphene before they entered the stalls and thereafter checking them daily and any ticks found on the animals removed manually.

THE PARASITE:

Three strains of Theileria parva (Theiler 1904) were used in the experiments.

Theileria parva (muguga) (Brocklesby et. al. 1961) was the laboratory strain used in this research. This is a strain which has been maintained between ticks and susceptible cattle for over ten years.

Theileria parva (aitong) (Edinburgh University, East African Veterinary Expedition 1970) was the other strain used in this research. The strain was isolated

at Aitong in Narok District of Kenya during field immunity trials againt Theileria parva (muguga). This strain was proved to be serologically similar to Theileria parva (muguga) (Burridge and Kimber 1972). Theileria parva (aitong) was chosen for comparison with Theileria parva (muguga) since it seemed to show a definite anaemia which is not characteristic for Theileria parva (muguga). Unfortunately, experiments with Theileria parva (aitong) stopped in the preliminary stage. There was power failure for over three days and the stabilates lost their viability. The latter strain was replaced by Theileria parva (Kiambu) which was isolated from infected ticks picked from cattle sick with East Coast Fever.

METHOD OF INFECTION:

The parasites were in stabilates (EAVRO Annual Report 1968). The stabilates are emulsions of prefed infected adult ticks. The emulsions are contained in fetal calf serum media and preserved with glycerol (7.5%). These stabilates are cooled slowly in "Revco" deep freeze where they are stored until needed. The stabilates were taken out of the deep freeze just before inoculation and were quickly thawed in a waterbath at 37°C. The stabilates after thawing were quickly mixed and necessary aliquots taken for infection of the bull calves. The stabilates were numbered according to the batch of ticks and strain used, so that in the ensuing experiments, the

following stabilates were used:

stabilate 20 - Theileria parva (aitong)

stabilate 21 - Theileria parva (muguga)

stabilate 44 - Theileria parva (muguga)

stabilate 32 - Theileria parva (Kiambu)

The stabilates were used undiluted or diluted (1:10) as will be specified under individual experiments. One millitre of stabilate was injected subcutaneously at the base of the right ear in all animals so that the local lymph node was the right parotid lymph node. Injections were made within twenty minutes after thawing the stabilates.

The day of infection was called Day Zero and the following day, Day 1, 2, 3 etc.

COLLECTION OF BLOOD SAMPLES:

Collection of blood samples was commenced at least three days before the animals were infected. These samples, including the samples taken on day 0 provided a baseline for each individual animal.

All haematologic and biochemical samples were collected after clinical examination was done and this time fell between 9.00 and 10.00 a.m. All blod samples were taken from jugular vein using twenty millitre disposable syringes and 18.5 gauge disposable needles.

About 4 millitres were quickly transferred to Bijou bottles containing dried disodium ethylenediamine tetra-acetic acid (EDTA) as anticoagulant at a concentration of 1-2 mg per millitre of blood. It was then mixed by shaking gently. The rest approximately 18-20 cc. of the blood was transferred to twenty millitre Universal bottles without anticoagulant for serum biochemistry. The latter was incubated in a waterbath at 37°C for about twenty minutes. The clotted blood was then centrifuged at room temperature for about 30 minutes at 2000 r.p.m. in MSE centrifuge (Measuring Scientific Equipment, London). Serum was collected using pasteur pipette transferred to clean dry test tubes.

HAEMATOLOGY:

PCV: This was determined using the method described by Dacie and Lewis (1968). Unheparinised micro-haematocrit capillary tubes (Authur H. Thomas Co., Philadelphia 5, U.S.A.) 75 mm in length and internal diameter 1.3 - 1.5 mm were used. These tubes were filled by capillary action upto half or 3/4 full. The dry ends were then sealed by heating in bunsen burner flame. They were then span at 12000 r.p.m. for 5 minutes in microhaematocrit centrifuge (Hawksley and Sons Ltd., London, England). Percentage packed cell volume was determined from the scale on Hawksley microhaematocrit reader.

HAEMOGLOBIN:

This was determined using Cyan-methemoglobin method using Coulter Counter (Coulter Electronics Inc. Hialeah, Florida 33010). This method utilises Zap-O-globin as a lysing agent and the results read in grammes percent haemoglobin from the Coulter Counter haemoglobinometer.

RED BLOOD CELLS (RBC):

The total RBC count was obtained by using Coulter Counter Model ZB (Coulter Electronics Inc. Hialeah, Florida 33010). EDTA blood was used and this was previously thoroughly mixed by Coulter mixer (High Street South, Bedfordshire LU6 3HT, England). The readings were made at the following Coulter Counter settings: -

Amplification 1/2

Aperture 0.177

Threshold 8

The readings were then corrected for coincidental passage of cells using Coulter Counter coincidence correction chart. The RBC readings were expressed in millions per cu mm of blood.

WHITE BLOOD CELLS (WBC):

These were also counted with Coulter Counter Model ZB (Counter Electronics Inc. Hialeah, Florida 33010) with the following settings: -

Amplification 1/2

Aperture 0.177

Threshold 16

The red blood cells were lysed using Zap-O-globin (Coulter Electronics Hialeah, Florida 33010) which contains 300 mg% of potassium cyanide. The lysed blood was left for a few minutes after which WBCs were calculated with the Coulter Counter. The same lysed blood was used in the counter haemoglobinometer for determination of haemoglobin. The readings of WBCs were in thousands per cubic millitre of blood after correction with the chart mentioned before.

M.C.V. AND MCHC:

Mean corpuscular volume (MCV) and Mean Corpuscular Haemoglobin Concentration (MCHC) were determined as described by Wintrobe (1932). MCV is expressed in cubic microns and MCHC as micromicrograms (uug).

DIFFERENTIAL COUNTS:

Differential white blood cell counts were made from blood smears stained with Giemsa stain. These smears were made from E.D.T.A. blood immediately as it arrived in the laboratory. Differential counts were made by Battlement method described by Schalm (1965). At least 100 white blood cells were counted using Marble blood cell Calculator (The Marble Blood Calculator Co., 30 W. Washington ST. Chicago 2, III., U.S.A.) recorded in percentages.

When the leukopenia was extreme and white blood cell count went below 1000 cells per cubic millitre of blood it was found that determination of differential counts was impossible. Therefore, after preliminary experiments E.D.T.A. blood for making smears for differential counts was concentrated with the method described for concentrating microfilariae (Bailey et. al. 1968). Equal volumes of 3% saponin and E.D.T.A. blood were mixed and immediately centrifuged for 3-5 minutes at 2000 r.p.m. A drop of the sediment was used for making a smear which was dried in air and stained with Giemsa stain. This was found to retain the morphology of WBC better than if blood-saponin mixture was allowed to stand for 3 minutes before centrifugation.

NEUTROPHILS AND LYMPHOCYTES:

Absolute values of the above cells were calculated from total WBC count and differential count as follows:

$$\text{Total WBC} \times \frac{\text{Cell Differential}}{100}$$

The numbers were recorded in thousands of cells per cubic millitre of blood.

Macroschizont Index (MSI): This was done following the method described by Jarret et. al. (1969). A count of 400 cells was made. This included both infected and non-infected lymphocytes and also macroschizonts outside the lymphocytes. Smudge cells were not counted. The

results were expressed as percentage of infected lymphocytes. Smudge cells were not counted. The results were expressed as percentage of infected lymphocytes.

PIROPLASM PERCENTAGE:

A count of 400 cells was made. Percentage of infected RBC was calculated from this figure.

PLATELETS:

These were enumerated as described by Baker (1966). Baar's fluid was used for diluting but Brilliant Cresyl Blue was left out as it formed a precipitate even after filtration. Baar's fluid contains formalin as a platelet fixative and saponin as a lysing agent for erythrocytes. E.D.T.A. blood was utilised. Using the white cell pipette, blood was sucked upto 0.5 mark and made upto 11 mark. The pipette was gently shaken and a few drops expelled before filling improved Neubauer Chamber. The latter was then allowed to stand in petri dish with moist blotting paper for about ten minutes to allow platelets to settle. Platelets were then counted in 80 small squares and the number multiplied by 1000 to give platelets per cubic millitre of blood.

TOTAL PROTEIN:

Serum obtained from haematocrit determinations was used in determination of total protein. Atago Refractometer was utilised. The instrument was set to zero with distilled water and protein value was determined by

substituting serum. Values were recorded in grammes per 100 ml of blood.

BIOCHEMISTRY DETERMINATIONS:

All hemolysed serum samples were not used in biochemical assay. Where it was possible, a fresh serum sample was obtained immediately from any animal whose serum hemolysed.

Total and Direct (Conjugated) Bilirubin:

Bilirubin determinations were done immediately after serum was separated. If it was not possible to do bilirubin analysis immediately, serum was stored in the dark in a refrigerator until analysis could be done.

Bilirubin analysis was done after Powell's method (1944). Diazo reagent was made by mixing 10 mls of 1% sulfanilic acid solution. Sodium nitrite solution was stored in a refrigerator since it is very unstable. The test was carried out as follows: -

Test: 0.4 ml serum + 0.2 ml Diazo reagent
+ 3.4 ml sodium benzoate urea reagent.

Control: 0.4 ml serum + 0.2 ml 1.5% Hydrochloric acid
+ 3.4 ml sodium benzoate urea.

Optical density (O.D.) was then read from a "Spectronic 20" calorimeter (Bausch & Lomb, Inc. Rochester 2, N.Y. U.S.A.) at 540 mu wavelength. Bilirubin values were then read

from a calibration curve. Values were recorded in milligrams per 100 mls of blood (mg%). The calibration graph had been previously made from serial dilutions of bilirubin standard, Lab-trol (Dade Chemicals). The above described method cannot detect small amounts of bilirubin. Such results were recorded as "negligible".

Sodium and Potassium Assays:

These two cations were measured using "Eel"(Evans Electroselenium Ltd., Halstead, Essex, England) Flame Photometer. The method used is that described in "Eel" Manual. Sodium Img/100ml standard was prepared from Sodium Chloride analar. A calibration curve of serial dilutions of the sodium standard was drawn against Flame Photometer readings. The same was done for potassium using potassium chloride (KCI). Serum for determination of sodium was diluted 1:500 using distilled water while Potassium content was measured on serum diluted 1:50 with distilled water. The photometer was adjusted to zero mark using distilled water and to 100 using 1.0 mg/100 ml standard of the appropriate cations. Sodium and potassium filters were used.

Sodium and potassium values in mg% were read from the appropriate calibration curve. These values were then converted to mEq/L by multiplying with 0.435 for sodium and 0.256 for potassium. Actual values of sodium and potassium were obtained by multiplying the results by the appropriate dilution factor.

Alkaline Phosphatase:

This was determined by method of Bessy, Lowry and Brock (1946). Calibration graph was drawn using Enzatrol standard (Dade Chemicals). Assays were done with B.D.H. (British Drug House Chemicals Ltd.) alkaline phosphate kit. Optical densities were read from "Spectronic 20" calorimeter at 400 mu. Values of alkaline phosphatase were then read from the calibration graph and expressed in Sigma units.

Chloride:

Serum chloride was determined using Schales and Schales (1941) method. A stock of chloride solution standard was made from sodium chloride (Analar Grade) which had been dried overnight at 120°C. 585 mg of the dry sodium chloride was dissolved in 1 litre of distilled water. One millitre of this solution contained 5 mEq/L of the chloride. 0.2 ml serum, made up to 2 mls with double distilled water was titrated with mercuric nitrate solution using 4 drops of diphenylcarbazone as indicator. The end point was the appearance of a pale violet colour. This titration was repeated with chloride standard solution. Chloride concentration in serum was calculated as follows:

$$\text{Serum chloride (mEq/L)} = \frac{\text{Titration of test serum}}{\text{Titration of cl standard}} \times 100$$

Mercuric nitrate solution was made up with 3.0 grammes

mercuric nitrate basic and 20 ml 2N nitric acid dissolved in 1 litre distilled water.

Blood Urea Nitrogen (BUN):

B.U.N. was measured with chromatographic paper (Urastrat), Harvey and Richards (1965), which has a high degree of accuracy, Schneck (1963). The Urastrat (Warner Chilott Laboratories) was dipped in 2 mls of serum contained in 10 x 75 mm test tubes and left for 30 minutes. Chromatographic paper could not measure B.U.N. levels below 10 mg/100 ml and these were recorded as below ten (<10).

Total Protein, Albumin and A/G Ratio:

Total protein and albumin were determined with Biuret method as described by Coles (1967). Biuret reagent was purchased already made up. Instead of using control serum in every experiment, a calibration graph was drawn using the versatol serum (Warner Lambert Co., Morris Plains, New Jersey). After mixing 0.5 ml serum with 9.5 ml of 23% sodium sulfate, 3 mls of mixture was pipetted into a clean test tube for total protein determination. To the remaining 7 mls of the mixture, 0.1 ml aerosol-OT (10%) and about 5 mls of ether were added. This mixture was then centrifuged at 2000 r.p.m. for 20 minutes in M.S.E. centrifuge so that firm globulin mat formed at ether-serum-sulfate interface. Without disturbing the globulin mat, 3 mls of subnatant was taken for albumin determination. To total protein and albumin

tubes, 5 mls Biuret reagent was added and allowed to stand for 30 minutes. Optical densities were read from "Spectronic 20" calorimeter at 530 mu. The protein and albumin values for the optical densities recorded were read from the calibration graph. Globulin was obtained by subtracting albumin from total protein. A/G ratio was then calculated by dividing the total albumin by the value of total globulin. The total protein, albumin and globulin were expressed in grammes per 100 ml serum.

Serum Glutamic-Oxalacetic Transaminase (SGOT):

This enzyme was determined by Dade's method as described by Coles (1967). A calibration curve was drawn using Enza-trol (Dade Division, American Hospital Supply Corporation, Miami, Florida). Optical densities of the samples were read from spectronic 20 calorimeter at wavelength of 505 mu. From O.D. readings obtained, units of SGOT were read from the calibration curve. The units were Sigma-Frankel units per millitre of serum. If the SGOT value exceeded 120 S.F. units, the serum was diluted with distilled water and rerun. The result was then multiplied by the dilution factor to give the correct value of SGOT.

Serum Lactate Dehydrogenase (LDH):

This enzyme was assayed by the method of Wacker et al. (1956) using the Accu-zyme LDH kit (Coulter Diagnostics, Inc., Hialeah, Florida 33014). The result

was expressed in Wacker units (W.U.). The test included running both the unknown and Coulter control with known activity. The activity of LDH in serum was calculated as follows: -

$$\frac{\text{O-D. of unknown sample}}{\text{O.D. of Coulter Control}} \times \text{Value of Control} = \text{LDH value of unknown}$$

The optical densities were read from a spectronic 20 calorimeter at 500 mu.

Since the LDH values of bovine serum are higher than in human, all serum samples were diluted 1:4 and results multiplied by 4.

Bromsulphthalein (B.S.P.) Clearance Test:

B.S.P. clearance tests were done according to the method described by Cornelius (1970). They were done before the animals were infected and then repeated when the animals were sick. The second test was done when the bilirubin levels started rising as very high levels of the latter may interfere with clearance of the B.S.P.

Merck Bromsulphthalein containing 500 mg/ 100 ml B.S.P. was used. A B.S.P. standard was first prepared by taking 0.5 ml of Merck B.S.P. and making it up to 50 ml with distilled water. This made up stock solution of 50 mg% of B.S.P. which was used as a standard. 0.02 ml of this stock contains 0.2 mg% of B.S.P.

The experimental calves were weighed first. Amount of B.S.P. needed for each calf was calculated with 1mg/lb

dy weight dosage. The B.S.P. dye was then injected
travenously into the right jugular vein. A preinjection
ood sample of 5 mls was taken before injection and then
st injection samples taken at 3 minutes, 5 minutes,
minutes and 30 minutes intervals from the left jugular
in.

e B.S.P. assay was then carried out as follows: -

) Standard: (preinjection serum)

0.5 ml serum + 0.5 ml 0.2 N NaOH + 0.02 ml B.S.P. stock + 4 ml H_2O. For blank substitute 0.2 N HCI for 0.2 N NaOH

) Tests: (post-injection serum)

0.5 ml serum + 0.5 ml 0.2 N NaOH + 4 ml H_2O.

Blank substitute 0.5 ml 0.2 N HCI for 0.2 N NaOH

e optical densities were read at 540 mu from spectronic
calorimeter (Lomb and Bosch).

lculation: $\frac{T.O.D.}{S.O.D.} \times 0.2$ mg% = mg% B.S.P.

T = Test S = Standard

graph was then plotted on semilog paper of concentrations
gainst time. T 1/2 values were then calculated from this
raph. Preinjection B.S.P. clearance values were then
mpared with post-injection.

CLINICAL EXAMINATION:

All the experimental animals were examined daily between 8.00 and 9.00 a.m. before sampling was done.

Rectal temperatures were taken twice a day at 8.00 a.m. and 4.00 p.m., using a clinical thermometer. A morning temperature of 103°F and above was considered as significant and was taken as start of the fever reaction.

Incubation period was taken as period between infection of the animals and the temperature rise above 103°F. Recovery time was the time when temperature dropped below 103°F and remained consistently below this level. If the temperature rose again above 103°F after one or more days when it was below 103°F, this was termed as remission.

Peripheral lymph nodes were palpated daily before and after infection. The prescapular lymph nodes were measured using calipers used in measuring tuberculin reaction. This was a rough measurement in that the lymph node was grabbed together with the enclosing skin and measured across its diameter. It was very difficult to regulate the amount of skin included in the measurement and therefore measurements varied even in normal lymph nodes. To decrease the error measurement was done twice and an average of the two taken. The size was expressed in centimeters (cm). Right prescapular gland (RPG) was the one consistently measured as no biopsies were

obtained from it. Left prescapular gland (LPG) was also measured until temperature rise when biopsies commenced being taken from it.

The cardiovascular system was evaluated by taking pulse rate. This was taken from the median artery. Pulses were counted for one minute. Pulse character and strength was also noted. It was recorded as strong or weak and either regular or irregular. Mucous membranes were also checked for any changes in colour and moisture content. The heart was auscultated with stethescope and rhythm and intensity of the sounds noted.

The respiratory system was also examined. Respiratory rate was recorded by counting the flank movements. This was confirmed by auscultating the chest and counting the respiratory rate for one minute. The muzzle and nostrils were examined any discharges being noted. Also any abnormal respiratory sounds such as rales were recorded when they occurred. Any apparent difficulty in breathing was recorded.

The digestive system was also examined daily. Appetite was evaluated based upon the amount of feed eaten by the animal. Faeces were examined for colour, consistency and amount. Rumen motility was recorded and strength of contractions noted. The buccal cavity was also examined daily especially the mucous membrane of the tongue for any abnormal colour developments including petechiation.

The condition, demeanour and coat of the animal was evaluated with findings recorded every day. Any ocular changes, such as discharges, development of opacity and dehydration were also recorded as they appeared. Those animals which died were routinely subjected to a post-mortem examination. Smears from spleen, lymph nodes, liver, lung and heart were taken. These were air-dried and stained with Giemsa stain. They were examined for Theileria parva macroschizonts. This was aimed at certifying the cause of death to be East Coast Fever.

INTRODUCTION TO PRELIMINARY EXPERIMENT

PRELIMINARY EXPERIMENT

Theileria parva (muguga) stabilate 21 and Theileria parva (aitong) stabilate 20 infections.

INTRODUCTION TO PRELIMINARY EXPERIMENT

This experiment was designed to help survey the parameters to be used in subsequent experiments. It was done in two parts using Theileria parva (muguga) stabilate 21 and Theileria parva (aitong) stabilate 20.

Experiments using the above stabilates were not carried beyond the preliminary stage. They lost potency after the "Revco" deep freeze in which they were contained was unfortunately malfunctioning over a week-end. There were some other Theileria parva (muguga) stabilates to be used but the whole of Theileria parva (aitong) strain was lost.

Calves were treated as described under materials and methods. They were infected with one cubic centimeter of concentrated inoculum at the base of the right ear.

R E S U L T S:

EXPERIMENT I A - Theileria parva (muguga) Stabilate 21 - infection

Clinical Signs:

The development of significant clinical signs is summarised on table I. Average incubation and reaction periods were eight and seven days consecutively. The peripheral lymph nodes became enlarged following temperature rise. Other major clinical signs like petechiation, diarrhea, harsh respirations, moist rales and cough developed much later after temparature rise except in calf E4 where harsh respirations immediately followed temperature elevation.

Tables 2A and 2B summarise major signs observed. The first sign of disease was the enlargement of right parotid lymph node which was the regional node to the site of inoculation. Temperature elevation followed (fig. I), with temperature above 103°F being considered as significant. The temperature remained high until time of death in calf E3 while it dropped below 103°F four days before death in E4.

Calves became dull and had stary coats. Other peripheral nodes as represented by the right prescapular lymph node, which was measured daily, became enlarged with temperature rise. Appetite was reduced but calves continued eating until three days before death. Body

condition remained fair as the reaction period was very short (Av. 7 days). Both calves showed hind-quarter weakness as the disease became severe, calf E4 becoming recumbent two days before death.

In both calves, there was increased nasal discharge. This was serous after infection in calf E3 and mucoid in both calves after temperature rose. A mucopurulent nasal discharge was evident in calf E4 three days before death. Harsh respirations were present after temperature reaction and dyspnoea was terminal. A short dry cough was recorded after temperature rise. The cough became moist and more distressed two days before death in both calves. Respiratory rate however remained within normal range.

Pulse rate increased considerably in both calves after thermal reaction and petechiation of the visible mucous mebranes occurred on the average 3½ days before death.

Faeces became soft immediately after temperature elevation. Fluid diarrhea was terminal in both calves. Ruminal contractions became weak with thermal reaction.

Calf E3 developed an edematous swelling around the right parotid lymph node on Day 9. This swelling later extended down to the intermandibular space.

Post-mortem examination showed typical East Coast Fever lesions as described by Munyua (1971). Contact smears taken from the liver, spleen, lungs and lymph nodes

showed typical macroschizonts in lymphocytes. Blood smears contained piroplasms. These findings confirmed that the calves had died from East Coast Fever, Theileria parva infection.

Haematology:

Macroschizonts were first seen in smears from right parotid lymph node (local lymph node to site of infection) six and four days (Average 5 days) after infection (Table I). The appearance of macroschizonts averaged three days before temperature elevation. These parasites were seen in smears from left prescapular gland (LPG) on the second day of thermal reaction (Table I). Piroplasms appeared in the erythrocytes three days after temperature reaction. Table 5A represents macroschizont indices (MSI) and piroplasm percentage changes in the two infected calves. There was a rapid increase in piroplasms in calf E3 which also got a higher parasitamia than calf E4. The former calf died earlier than the latter.

The most significant haemotologic change was leukopenia. In this experiment, a drop in total leukocytes occurred before temperature rose (Table 6 and Fig. 2). In calf E4, the leukocytes increased between days 10 and 13 but then dropped again. This temporary disturbance could have been caused by a stress of sternal marrow biopsy. The calf which became weak and almost went into shock after the biopsy was taken recovered afterwards without

any treatment. The eventual drop in leukocytes involved all the white blood cells as can be seen from the values of the two major groups, the lymphocytes and the neutrophils (table 7 and 8).

Table 4A contains means and standard deviations of those biochemical and haemotological parameters measured in both calves infected with Theileria parva (muguga).

Red blood cells (RBC) and haemoglobin (Hb) values did not show any appreciable change. At the same time the MCV and MCHC remained essentially normal. Packed cell volume (PCV) also did not change (fig. 3).

Circulating blood platelet levels remained normal (table 4A).

Biochemistry:

As shown on table 4A, there was essentially no change in total protein. Pre-infection and post temperature rise means and standard deviations were 5.93 ± 0.276 and 5.78 ± 0.484 consecutively. No changes were recorded in albumin, globulin and A/G ratio.

A slight drop occurred in potassium and chloride levels (table 4A). The drop is only notable in last three days before calf E4 died (Appendix IA). Sodium levels remained normal. The reduction in chloride and potassium levels apparently coincides with development of diarrhea.

Serum alkaline phosphatase levels remained within

normal. Mean and standard deviation for the pre-infection and post-temperature rise levels were 2.55 ± 0.737 respectively (tables 4A and 9). Mean and standard deviation for four control calves was 2.09 ± 0.550 (table 4C).

Serum glutamic oxalacetic transaminase (SGOT) had marked elevation (table 10). SGOT went up continually after thermal reaction and reached maximum levels before the calves died. SGOT in 4 control calves was 77.2 ± 15.25 S.F. units (table 4C).

Lactate dehydrogenase (LDH) rose sharply terminally in both infected calves (table 11 and fig. 4). Levels in four control calves were 465.73 ± 101.95 Wacker units (table 4C).

Total bilirubin had increasing levels a day after temperature rise above 103°F (table 12 and fig. 5) Change in this parameter follows SGOT trend. Control calves retained normal bilirubin levels (Table 4C).

Blood urea nitrogen (BUN) reached significant levels in calf E4 but levels remained within normal in calf E3 (table 13).

EXPERIMENT IB - THEILERIA PARVA (AITONG) STABILATE 20 INFECTION

Clinical Signs:

Results are summarised on tables 1, 3A and 3B. Incubation period averaged 8 days. The reaction period was 14 days (13-15). Enlargement of peripheral lymph nodes coincided with temperature rise.

The right parotid lymph node was noticed swollen two days after infection. Appetite remained good in both calves upto 5 days after temperature reaction when it became depressed followed by complete anorexia.(tables 3A and 3B). Both calves lost condition and had hindquarter weakness with knuckling of fetlocks and staggering gait.

The peripheral lymph nodes (as represented by right prescapular lymph node) became enlarged at temperature rise and regressed in size before the calves died.

Respirations became harsh and laboured as disease progressed. The calves developed a dry cough few days after temperature rise and it later became moist as pulmonary edema developed. Respiratory rate increased after infection.

There was no significant change in pulse rate. Only one calf developed petechiae of mucous membranes 9 days after temperature rise (5 days before death).

Faeces became soft several days after thermal reaction but diarrhea was seen terminally (Av. 3.5 days).

Ruminal movements became weak a few days after the calves became sick. Clinically, both calves had slight dehydration.

The calves were necropsied after death and smears taken from spleen, lymph node, liver, and lungs. Blood smears were also taken and all stained with Giemsa stain.

The presence of macroschizonts in organ smears and piroplasms in the erythrocytes confirmed death from East Coast Fever.

Haematology:

Macroschizonts were seen in regional lymph node smears six days after infection in both calves. This was 2.5 days before temperature rise (table I). Appearance of macroschizonts in left prescapular gland (LPG) coincided with rise of temperature while piroplasms appeared in blood 2 days after thermal reaction (table I). LPG represented other peripheral lymph nodes in sampling for MSI. Piroplasm percentage and MSI% for both calves are shown on table 5B. Piroplasm parasitaemia increased steadily in both calves to a maximum of 40% at time of death. There is no definite pattern in increase of MSI.

Leukopenia coincided with rise of temperature (table 6). The decrease in leukocytes was more marked towards death making it difficult to do a differential count (fig. 3). When leukopenia was extreme, there were hardly any other cells visible on blood smears except

lymphocytes and very occasional neutrophils. Absolute values of the two cells show a decrease in both (Tables 7 and 8). These findings demonstrate that there is a leukopenia.

There was slight drop in erythrocytes and haematocrit values (fig. 4) suggesting a slight degree of anemia. Since MCV and MCHC did not change (table 4B), the anemia was apparently normocytic normochromic.

Circulating platelet count was not altered.

Biochemistry:

Total protein, globulin and albumin did not change significantly. It was the same with albumin - globulin ratio.

Sodium, potassium and chloride dropped slightly. This was presumably due to the diarrhea which developed in these two infected calves.

Serum alkaline phosphatase level decreased slightly but this is within normal (Tables 4B and 9).

Serum glutamic oxalacetic transminase (SGOT) had rising levels after the calves became sick. SGOT levels reached maximum before death (Table 11). SGOT levels in control calves is given in table 12.

Lactate Dehydrogenase (LDH) changes in infected calves are shown on table 13 and figure 5. This parameter rose sharply after calves got a temperature rise.

Average incubation period was 8.5 days (table 1). Calves died when the LDH levels went above 1000 wacker units. Table 14 contains LDH values of the control calves while figure 5 includes mean LDH changes in control group.

Total bilirubin went up after rise of temperature in calf number E2 while there was a time lag before the levels went up in calf number E1 (table 15). Figure 6 represents the mean levels in both infected and control calves. From the latter figure, the sick calves died with high levels of bilirubin.

Blood urea nitrogen (BUN) did not have marked change in calves infected with theileria parva (aitong) calf number E1 had slight elevation (table 17).

DISCUSSION

DISCUSSION FOR PRELIMINARY EXPERIMENT

The clinical signs observed in this experiment with Theileria parva (muguga and aitong) infections agree with the findings of the previous authors.

Clinical signs resembled those of the acute disease described by Neitz (1957). The incubation period was eight days in both infections. Brocklesby (1962) found the incubation period to vary between 10 and 17 days. Considering that only two calves were infected with each of the above strains, eight days incubation period is not far from Brocklesby's findings. Febrile period of 7 days (T. parva - muguga) and 13.5 days (T. parva - aitong) is within 7-18 febrile period described by the latter author.

Several authors (Henning 1956, Dixon 1910, and Neitz 1957) described the rise of temperature as the first evidence of disease. In this experiment, enlargement of the right parotid lymph node was noticed to occur about the second day after infection. This was the local drainage lymph node to the site of infection. Swelling of the other peripheral lymph nodes coincided with thermal reaction and they regressed in calves infected with Theileria parva (aitong). These calves reacted longer than those infected with Theileria parva (muguga). Barnett (1960) also reports regression of lymph nodes in animals infected with Kenya "strain" of Theileria parva but not with

South African strain. Henning (1956), Dixon (1910) and Neitz (1957) report that other signs occurred much later after temperature rise. In this experiment, calves became dull and had stary coats immediately after the temperature went up. Other signs were observed later as described by the above authors. These were gradual loss of appetite, increased mucoid nasal discharge and cessation of rumination. Complete loss of appetite was terminal and in effect loss of condition was only slight as also observed by Henning (1956).

Diarrhea was terminal occurring about 3 days before death. No dysentery was present as reported by Neitz (1957).

Progressive hindquarter weakness as described by Henning (1956) was also observed in this work. This caused inco-ordination and eventual recumbency, one calf becoming recumbent two days before death.

A rather rare sign was observed in this experiment. This was an edematous swelling of the head on the right, the side infected with the stabilate. The swelling extended from the base of the right ear to the intermandicular space. This rare sign has only been observed by (Neitz 1957) who described it as variable swelling of the eyelids, ears and jaw region.

Except for the short reaction period in the calves infected with Theileria parva (muguga), there was no other appreciable differences clinically between the latter and

Theileria parva (aitong) infection.

The most consistent haematological change in the infections with Theileria parva (muguga) and (aitong) was leukopenia. Several workers have observed this leukopenia (Strickland 1916, Steck 1928, Wilde 1963, Brown et al. 1965, Wilde 1967, Munyua 1971 and Barnett 1960). Barnett (1960) recorded leukopenia as commencing 2-7 (Av. 4) days after onset of fever. In this work, drop in leukocytes occurred at the temperature rise. This drop in total leukocytes almost preceded temperature reaction in Theileria parva (muguga) infection. Since the calves infected with the latter died after a short illness (7 days), it seems reasonable to suggest that the early development of leukopenia shows high virulence of the parasite. The absolute numbers of lymphocytes and neutrophils were decreased in this experiment and these were only cells observed when leukopenia was severe. This finding indicates a panleukopenia also described by Steck (1928), Wilde (1963) and Barnett (1960). Wilde (1963) ascribes the leukopenia to a maturation arrest of the leukocytic series. Steck (1928) and Barnett (1960) observe that if leukopenia is extreme, the animals fail to recover. Barnett (1960) went further to suggest that animals whose leukocytes dropped down to 1000 cells/Cmm. of blood died within 1-2 days.

Anemia was not observed in calves infected with Theileria parva (muguga). According to Brown et al. (1965)

and Munyua (1971), slight anemia was only observed in calves suffering a prolonged Theileria parva (muguga) infection. Calves infected with Theileria parva (muguga) reacted for seven days which was a short period.

Calves infected with Theileria parva (aitong) demonstrate a slight degree of an apparently progressive anemia with a slight drop in erythrocytes, haemoglobin and haematocrit values. These calves reacted only for about fourteen days which cannot be described as prolonged. This finding therefore supports Snodgrass et al. (1972) and Irvin et al. (1972). Both authors describe a pronounced anemia in Theileria parva (aitong) infections. It would have been necessary to investigate this finding further if the Theileria parva (aitong) stabilate did not lose viability.

Though Wilde et al. (1965) observed a pronounced thrombocytopenia, it could not be demonstrated in this work. Thrombocyte counts remained normal.

The prepatent periods in Theileria parva (muguga) and (aitong) infections was 5 and 6 days respectively. This was about 3 days before temperature rise in both infections. Barnett (1960) found macroschizonts in the local lymph node 3 days after enlargement of the latter which is about the same as the above results. Macroschizonts were found in other peripheral lymph nodes on the first day of febrile reaction which was also observed by Barnett (1960). Piroplasms were found in the blood

about 3 days after temperature reaction.

Serum total proteins did not change. This result conforms to the findings of Munyua (1971).

A slight decrease was evident in serum electrolytes measured. This decrease coincided the development of diarrhea. No change in the electrolytes was observed in the calf which did not develop diarrhea. The electrolytes estimated were sodium, potassium and chloride.

Serum alkaline phosphatase did not have any significant change in calves infected with Theileria parva (muguga). There was a slight drop in the two calves infected with Theileria parva (aitong). This enzyme was included in this research predominantly as a liver function test. However, Garner (1952) cautions on the use of the enzyme as an indicator of liver function as it has a wide range even in normal animals. The main cause of elevation of the enzyme is due to biliary obstruction which is not normally encountered in East Coast Fever cases. Barnett et al. (Unpublished work) also found no significant trend in alkaline phosphatase levels. The slight decrease encountered in this experiment is difficult to explain.

Total serum bilirubin went high in all the sick

calves after temperature rise. Roets (1943), Schindler et al. (1968) and Barnett et al. (Unpublished) also observed the increase in serum bilirubin. Barnett et al. (Unpublished) noted that there was an increase in indirect reacting bilirubin. In this preliminary experiment, direct bilirubin was not determined. An elevation in indirect bilirubin would be expected if there is liver necrosis as reported by Munyua (1971). Garner (1953) reported elevated bilirubin in cases of severe bovine liver disease.

Blood urea nitrogen (BUN) was significantly elevated in one calf. Slight increases occurred in the other calves. This parameter is most often used as an index of renal damage but Campbell (1970) warns that other conditions may increase blood urea. These include conditions with excessive production of urea such as high protein intake or increased protein catabolism occurring in starvation, fever, or sepsis. Munyua (1971) observed degenerative changes in the kidneys of calves dying of East Coast Fever. These were fatty infiltration, necrosis and hyaline casts in lumen of the renal tubules. If these lesions are severe enough they can cause the elevation in BUN as observed in one calf.

Lactate dehydrogenase (LDH) was elevated in all the sick calves. Levels rose sharply before the calves died. Schindler et al. (1968) encountered increased LDH levels in animals sick with East Coast Fever. The increase

S U M M A R Y:

observed is possibly due to liver necrosis (Munyua 1971). Boyd (1962) also found liver necrosis to cause elevated LDH in cattle.

Marked elevation in serum glutamic oxalacetic transaminase (SGOT) was seen in these studies. Neitz (1957) observed muscular degeneration in some of infected animals. Munyua (1971) reported hepatic necrosis in the infected cases. Since elevation of SGOT would be expected with tissue destruction (Kuttler and Marble 1958, Cornelius et al. 1959), the elevation in SGOT can be explained on the basis of the findings of the above authors. Munyua (1971) found only slight elevations.

S U M M A R Y:

The disease produced conforms with acute disease described by Neitz (1957). There was essentially no difference in signs produced by Theileria parva (muguga) and (aitong) infections except that the former was more acute.

Haematology revealed a panleukopenia which was marked towards death. This leukopenia started immediately after temperature rise. Slight anemia was present in T. parva (aitong) infection. The calves infected with the latter survived longer and achieved higher piroplasm parasitaemia which could have contributed to the slight anemia observed.

Marked elevations occurred in serum glutamic oxalacetic transaminase (SGOT) and lactate dehydrogenase (LDH). Bilirubin was also elevated. The elevated SGOT, LDH and bilirubin parameters suggest significant damage of the liver and therefore warrants performing the bromphthalein (BSP) clearance test to evaluate the extent of the liver damage. These chemical changes could also be measured routinely in East Coast Fever for prognostic purposes.

TABLE I:

SUMMARY OF RESULTS IN CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 21 AND THEILERIA PARVA (AITONG) STABILATE 20

ANIMAL NO.	DAYS TO MACROS IN REG.	DAYS TO MACROS IN LPG.	DAYS TO PIRO-PLASM IN BLOOD	DAYS TO TEMP. 103°F	DAYS TO PETECHI-ATION	DAYS TO DIARRHEA	DAYS TO RESPI-RATORY HARSHNESS	DAYS TO ENLARGE-MENT OF RPG.	REACTION PERIOD	DAYS TO COUGH
THEILERIA PARVA (MUGUGA)										
E 3	6	9	11	8	10	12	12	9	6	10
E 4	4	9	11	8	13	14	9	9	8	11
AVERAGE	5	9	11	8	11.5	13	10.5	9	7	10.5
THEILERIA PARVA (AITONG)										
E 1	6	8	10	8	16	17	12	9	13	10
E 2	6	9	11	8	-	19	11	8	15	11
AVERAGE	6	8.5	10.5	8	16	18	11.5	8.5	14	10.5

REG - Right Ear Gland

LPG - Left Prescapular Gland

MACROS- Macroschizonts

KEY TO TABLES 2A, 3B, 3A AND 3B

RPG - Right prescapular lymph node

M.M. - Mucous mebranes

- PI - Pink
- PA - Pale
- PE - Petechiae

R.R. - Respiratory rate

R.S. - Respiratory sounds

- 0 - Normal
- 1 - Slightly harsh
- 2 - Harsh
- 3 - Very harsh (Dyspnea

N.D. - Nasal Discharge

- \+ - Serous
- ++ - Mucoid
- +++ - Mucopurulent
- ++++ - Purulent

APP. - Appetite

- G - Good

DEHYD. - Dehydration

CONDITION: -

- F - Fair
- G - Good
- P - Poor

DEM - Demeanor

- B - Bright
- D - Dull

COAT: -

- R - Stary
- SM - Smooth

O.D. - Ocular Discharge

- \+ - Serous
- ++ - Mucoid
- +++ - Mucopurulent
- ++++ - Purulent

RUMEN: -

- S - Strong
- W - Weak

TABLE 2A:

CLINICAL SIGNS IN CALF NUMBER E3 - T. PARVA (muguga)

DAY	TEMP. °F	RPG	PULSE RATE/ MIN.	M.M.	R.R./ MIN	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	101.8	1.4	60	PI	20	0	-	-	G	-	S	-	G	B	SM	-
1	101	1.4	60	PI	16	0	-	+	G	-	S	-	G	B	SM	-
2	100	1.4	68	PI	12	0	-	+	G	-	S	-	G	B	SM	-
3	100.6	1.4	68	PI	12	0	-	+	G	-	S	-	G	B	SM	-
4	102.4	1.4	60	PI	14	0	-	+	G	-	S	-	G	B	SM	-
5	102	1.4	68	PI	16	0	-	+	G	-	S	-	G	B	SM	-
6	101.2	1.4	80	PI	28	0	-	+	G	-	S	-	G	B	SM	-
7	101.8	1.4	112	PI	30	2	-	+	G	-	S	-	G	D	SM	-
8	104.8	1.8	100	PI	32	2	-	++	DE	-	S	-	G	D	SM	-
9	106.2	1.9	120	PI	30	2	dry	++	DE	soft	W	slight	G	D	R	-
10	106.8	1.8	104	PE	24	2	+	++	A	+	W	+	F	D	R	-
11	105.2	1.8	106	PE	28	2	+	++	A	+	W	+	F	D	R	-
12	106.2	2.1	110	PE	30	3	moist	++	A	fluid	W	+	F	D	R	-
13	108	2.2	110	PE	32	3	+	++	A	fluid	W	+	F	D	R	-

TABLE 2B CLINICAL SIGNS IN CALF NUMBER E 4 - T. PARVA (muguga)

DAY	TEMP. °F	RPG cm.	PULSE RATE/ MIN.	M.M.	R.R./ MIN.	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	100.8	1.4	52	PI	12	0	-	-	G	-	S	-	G	B	SM	-
1	101.4	1.4	64	PI	20	0	-	-	G	-	S	-	G	B	SM	-
2	100.6	1.4	56	PI	20	0	-	-	G	-	S	-	G	B	SM	-
3	100.4	1.4	72	PI	24	0	-	-	G	-	S	-	G	B	SM	-
4	102.6	1.4	60	PI	28	0	-	-	G	-	S	-	G	B	SM	-
5	101.8	1.4	60	PI	24	0	-	-	G	-	S	-	G	B	SM	-
6	102	1.4	60	PI	26	0	-	++	G	-	S	-	G	B	SM	-
7	101.6	1.6	62	PI	24	0	-	++	G	-	S	-	G	B	SM	-
8	104.2	1.8	60	PI	32	2	dry	++	DE	-	S	-	G	D	R	-
9	104.6	1.8	80	PI	32	2	+	++	DE	-	W	-	G	D	R	-
10	107.0	1.8	108	PI	28	2	+	++	DE	+	W	-	G	D	R	-
11	103	2.0	88	PI	20	2	+	++	DE	+	W	-	G	D	R	-
12	101.6	2.0	86	PI	24	2	+	++	DE	+	W	-	G	D	R	-
13	100.6	2.1	90	PE	20	3	+	+++	A	+	W	-	G	D	R	-
14*	100.6	2.0	84	PE	20	3	moist	+++	A	fluid	W	-	G	D	R	-
15	102.2	2.0	90	PE	28	3	moist	+++	A	fluid	W	-	G	D	R	-

* The calf became recumbent on this day

TABLE 3A

CLINICAL SIGNS IN CALF NUMBER E I - T. PARVA (aitong)

DAY	TEMP. °F	RPG. cm.	PULSE RATE/ MIN.	M.M.	R.R./ MIN.	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	100.2	1.2	52	PI	20	0	-	+	G	-	S	-	F	B	SM	-
1	99.6	1.2	52	PI	16	0	-	+	G	-	S	-	F	B	SM	-
2	101.8	1.2	72	PI	24	0	-	-	G	-	S	-	F	B	SM	-
3	102	1.2	72	PI	24	0	-	-	G	-	S	-	F	B	SM	-
4	102.4	1.2	70	PI	24	0	-	-	G	-	S	-	F	B	SM	-
5	101.8	1.2	72	PI	26	0	-	-	G	-	S	-	F	B	SM	-
6	102	1.3	64	PI	16	0	-	-	G	-	S	-	F	B	SM	-
7	102.2	1.2	52	PI	20	0	-	-	G	-	S	-	F	B	SM	-
8	104.2	1.2	72	PI	20	0	-	-	G	-	S	-	F	B	SM	-
9	105.6	1.8	80	PI	26	0	-	-	G	-	S	-	F	B	R	-
10	106.2	2.0	88	PI	28	1	+	-	G	-	S	-	F	D	R	-
11	106.2	2.0	80	PI	26	2	+	-	G	-	S	-	F	D	R	-
12	105.6	2.0	80	PI	40	3	moist	-	G	-	W	-	F	D	R	-
13	106.8	2.2	80	PI	40	3	moist	-	DE	-	W	slight	F	D	R	-
14	106.1	2.0	76	PI	52	3	+	-	DE	-	W	+	F	D	R	-
15	106.8	1.6	72	PI	52	3	+	-	A	soft	W	+	F	D	R	-
16	106.8	1.2	68	PE	28	3	+	-	A	soft	W	+	F	D	R	-
17	106.1	1.2	64	PE	24	3	+	-	A	fluid	W	+	P	D	R	-
18	106.1	1.3	72	PE	40	3	+	-	A	fluid	W	+	P	D	R	-

TABLE 3B

CLINICAL SIGNS IN CALF NUMBER E 2 - T. PARVA (aitong)

DAY	TEMP. °F	RPG Cm.	PULSE RATE/ MIN.	M.M.	R.R./ MIN.	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	100.4	1.4	60	PI	16	0	-	+	G	-	S	-	F	B	SM	+
1	101	1.2	52	PI	16	0	-	+	G	-	S	-	F	B	SM	-
2	102.2	1.2	84	PI	36	1	-	++	G	-	S	-	F	B	SM	-
3	102.6	1.2	80	PI	28	0	-	++	G	-	S	-	F	B	SM	-
4	102	1.2	76	PI	24	0	-	-	G	-	S	-	F	B	SM	-
5	101.6	1.2	80	PI	26	0	-	-	G	-	S	-	F	B	SM	-
6	103.4	1.2	72	PI	32	0	-	-	G	-	S	-	F	B	SM	-
7	102	1.2	72	PI	24	0	-	++	G	-	S	-	F	B	SM	-
8	105.8	1.4	72	PI	24	0	-	-	G	-	S	-	F	B	SM	-
9	104.8	1.6	70	PI	20	0	-	-	G	-	S	-	F	D	R	-
10	104.3	2.0	76	PI	40	2	-	-	G	-	S	-	F	D	R	-
11	105.2	2.0	80	PI	40	2	-	-	G	-	S	-	F	D	R	-
12	106.6	2.1	84	PI	48	2	dry	-	G	-	S	-	F	D	R	-
13	106.8	1.8	84	PI	44	2	+	++	DE	-	W	-	F	D	R	-
14	105.4	1.6	84	PI	40	2	moist	++	DE	-	W	-	F	D	R	-
15	106.4	1.6	80	PI	40	2	+	-	A	soft	W	slight	P	D	R	-
16	105.4	1.2	72	PI	32	3	moist	-	A	soft	W	+	P	D	R	-
17	105	1.2	72	PI	28	3	moist	-	A	+	W	+	P	D	R	-
18	104.6	1.2	64	PI	32	3	+	-	A	+	W	+	P	D	R	-

KEY TO TABLES 4A, 4B AND 4C.

- Number of radings
- Standard Deviation
V - Mean Corpuscular volume
HC - Mean corpuscular haemoglobin concentration
- Haemoglobin
- Total Protein
- Albumin
- Globulin
G - Albumin - globulon ratio
- Potassium
+ - Sodium
- - Chloride
- Alkaline Phosphatase
Ts - Platelets
B.C. - Red blood cells
C.V. - Packed cell volume
OT - Serum glutamic oxalacetic transaminase
H - Lactate dehydrogenase
- Total bilirubin

PRE-INFECTION AND POST-TEMPERATURE RISE MEANS AND STANDARD DEVIATIONS OF BIOCHEMICAL AND HAEMATOLOGICAL CHANGES IN CALVES INFECTED WITH EAST COAST FEVER

(A) Theileria Parva (muguga) - Stabilate 21 Infection

(Calves E3 & E4)

	PRE-INFECTION LEVELS			POST-TEMPERATURE RISE LEVELS (TEMPERATURE ABOVE 103°F)		
ETER	N	MEAN	SD	N	MEAN	SD
	8	5.93	0.276	12	5.78	0.484
	8	3.54	0.196	12	3.12	0.428
	8	2.39	0.093	12	2.51	0.581
Ratio	8	1.47	0.049	12	1.44	0.540
	8	5.54	0.527	8	3.79	1.305
L	8	157.58	11.83	8	162.1	14.79
L	8	116.39	9.02	12	102.32	13.08
L	8	2.55	0.306	11	2.08	0.737
U						
C./Cmm	8	8.66	1.46	12	9.86	0.620
	8	41.83	5.71	12	40.43	3.95
	8	35.26	3.20	12	31.92	2.02
	8	12.24	1.64	12	12.73	0.91
/Cmm	8	632.6	151.5	12	520.8	92.41
V.	8	35.6	2.36	12	39.8	4.12

4 (B) Theileria Parva (aitong) - Stabilate 20 Infection
(Calves E1 & E2)

METER	PRE-INFECTION LEVELS N	MEAN	SD	POST-TEMPERATURE RISE LEVELS (TEMPERATURE ABOVE 103°F) N	MEAN	SD
	6	5.98	0.225	22	5.51	0.343
	6	2.81	0.211	22	3.01	0.197
	6	3.17	0.346	22	2.55	0.320
Ratio	6	0.90	0.158	22	1.23	0.156
	6	5.67	0.634	19	4.07	0.413
/L	6	150.8	14.35	19	138.5	10.93
/L	6	127	15.87	22	113.8	6.30
/L	6	2.18	0.453	21	1.28	0.580
. U						
.C. 10^6/Cmm	6	8.33	0.378	22	7.16	2.048
.V.	6	39	1.0	22	39.6	2.11
C	6	33.95	0.82	22	34.38	2.11
.	6	10.98	0.62	22	9.28	0.93
s	6	695	9.57	21	730	81.7
m 10^3						
.V.	6	32	1.63	22	27	1.93

LE 4C

MEANS AND STANDARD DEVIATIONS (SD) IN SOME SERUM BIOCHEMICAL PARAMETERS MEASURED IN 4 CONTROL CALVES IN EXPERIMENT I

PARAMETER	N	MEAN	S.D.
AP Sig. Units	58	2.09	0.550
SGOT S.F. Units	58	77.20	15.25
LDH W.u	58	465.73	101.95
TB mg%	52	0.36	0.156

5A

CROSCHIZONT INDICES (MSI%) AND PIROPLASM PERCENTAGE IN CALVES AND E4 INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 21

DAY	M.S.I. % CALVES		PIROPLASM % CALVES	
	E 3	E 4	E 3	E 4
8	-	-	-	-
9	(0.25)	(1.0)	-	-
10	1.25	4	-	-
11	3.0	6	(0.8)	(0.2)
12	16.0	15	8.0	1.0
13	40.0	21	18.0	2.5
14		52		4.0
15		56		5.0

DAILY LEUKOCYTE COUNT (W.B.C/Cmm x 10^3) IN CALVES INFECTED WITH EAST COAST FEVER (ECF) THEILERIA PARVA (MUGUGA) AND (AITONG) INFECTION

S AFTER FECTION	T. PARVA (aitong) CALF NUMBERS E I	E 2	MEAN	T. PARVA (muguga) CALF NUMBERS E 3	E 4	MEAN
0	6.87	8.20	7.54	8.68	9.75	9.22
1	8.30	9.20	8.75	9.20	8.70	8.95
2	12.00	14.00	13.00	7.80	7.20	7.50
3	7.70	6.30	7.00	-	-	-
4	-	-	-	7.40	7.00	7.20
5	7.90	7.40	7.65	-	-	-
6	6.40	7.90	7.15	4.80	4.50	4.65
7	6.30	6.30	6.30	3.70	4.30	4.00
8	4.10	3.70	3.90	3.60	4.30	3.95
9	4.00	3.10	3.55	4.30	4.50	4.40
10	4.00	3.20	3.60	3.60	6.50	5.05
11				4.30	7.60	5.95
12	4.00	2.00	3.00	-	-	-
13	1.67	0.893	1.28	2.20	5.60	3.90
14	1.06	0.440	0.75	-	3.30	3.30
15	0.740	2.68	1.71	-	2.30	2.30
16	2.90	0.929	1.92			
17	3.00	2.80	2.90			
19	1.30	1.70	1.50			
20	1.17	1.90	1.54			
21	1.30	-	1.30			

ABSOLUTE LYMPHOCYTE (/Cmm x 10^3) COUNTS IN CALVES INFECTED WITH EAST COAST FEVER (ECF) THEILERIA PARVA (MUGUGA) AND (AITONG) INFECTIONS

S AFTER FECTION	T. PARVA (aitong) CALF NUMBERS E I	E 2	MEAN	T. PARVA (muguga) CALF NUMBERS E 3	E 4	MEAN
0	5.90	7.90	6.90	6.90	6.60	6.75
1	5.88	5.81	5.85	6.35	5.74	6.05
2	5.10	6.84	5.97	5.77	5.04	5.41
3	5.10	6.47	5.79	-	-	-
4	-	-	-	5.18	4.76	4.97
5	6.32	6.08	6.20	-	-	-
6	5.86	5.57	5.72	3.60	3.87	3.74
7	3.11	4.60	3.86	2.48	3.18	2.83
8	2.45	3.48	2.97	2.74	3.27	3.01
9	1.98	3.00	2.49	2.41	3.24	2.83
10	1.32	3.02	2.17	2.59	5.27	3.93
11	-	-	-	3.66	6.46	5.06
12	1.32	2.62	1.97	-	-	-
13	-	0.885	0.89	-	3.53	3.53
14					2.57	2.57

ABSOLUTE NEUTROPHIL COUNTS (Cmm x 10^3) IN CALVES INFECTED WITH EAST COAST FEVER (ECF) THEILERIA PARVA (MUGUGA) AND (AITONG) INFECTIONS

AFTER CTION	T. PARVA (aitong) CALF NUMBERS E I	E 2	MEAN	T. PARVA (muguga) CALF NUMBERS E 3	E 4	MEAN
0	2.91	1.60	2.26	1.29	2.80	2.05
1	2.49	3.68	3.09	2.67	2.78	2.73
2	5.16	7.98	6.57	1.87	2.16	2.02
3	1.16	1.20	1.18	-	-	-
4	-	-	-	2.00	2.10	2.05
5	1.74	2.22	1.98	-	-	-
6	0.83	1.58	1.21	1.06	0.59	0.83
7	1.70	0.441	1.07	1.18	1.06	1.12
8	0.62	0.592	0.61	0.76	0.90	0.83
9	1.00	0.651	0.83	1.85	1.04	1.45
10	0.88	1.22	1.05	0.83	1.24	1.04
11	-	-	-	0.66	1.14	0.90
12	1.24	0.680	0.96	-	-	-
13	0.785	-	0.79	-	1.96	1.96
14	-	-	-	-	0.69	0.69

SERUM ALKALINE PHOSPHATASE (SIG. UNITS) IN CALVES INFECTED WITH EAST COAST FEVER (E.C.F.) THEILERIA PARVA (MUGUGA) AND (AITONG) INFECTIONS

AYS AFTER INFECTION	T. PARVA (aitong) CALF NUMBERS E I	E 2	MEAN	T. PARVA (muguga) CALF NUMBERS E 3	E 4	MEAN
0	1.51	2.52	2.02	2.26	2.84	2.55
1	1.75	2.50	2.13	1.62	1.05	1.34
2	1.45	2.50	1.98	2.15	2.45	2.30
3	1.60	2.50	2.05	-	-	-
4	-	-	-	2.25	2.85	2.55
5	1.25	2.30	1.78	-	-	-
6	2.10	3.40	2.75	1.75	2.65	2.20
7	1.90	3.05	2.48	1.80	2.07	1.94
8	2.00	2.90	2.45	4.20	2.30	3.25
9	2.12	2.35	2.24	2.25	1.85	2.05
10	1.90	2.30	2.10	2.00	1.55	1.78
11	-	-	-	1.50	1.30	1.40
12	1.25	1.15	1.20	-	-	-
13	1.44	1.65	1.55	2.95	2.85	2.90
14	0.75	0.75	0.75	-	-	-
15	1.03	0.65	0.84	-	3.45	3.45
16	0.50	0.60	0.55	-	-	-
17	0.60	0.75	0.68			
19	0.85	1.05	0.95			
20	1.45	1.30	1.38			
21	-	1.50	1.50			

IO

SERUM GLUTAMIC OXALACETIC TRANSMINASE (SGOT) IN CALVES INFECTED WITH EAST COAST FEVER, THEILERIA PARVA (MUGUGA) AND (AITONG) INFECTIONS (S.F. UNITS)

S AFTER FECTION	T. PARVA (aitong) CALF NUMBERS EI	E 2	MEAN	T. PARVA (muguga) CALF NUMBERS E 3	E 4	MEAN
0	59	81	70	93	62.3	77.6
1	90	97	93.5	62	62	62
2	110	99	104.5	55	58	56.5
3	64	85	74.5	-	-	-
4	-	-	-	74	80	77
5	74	74	74	-	-	-
6	61	72	66.5	74	94.8	84.4
7	77	102	89.5	94.8	90.0	92.4
8	52	64	56	80	104	92.0
9	42	70	56	110	136	123
10	88	110	99	108	340	224
11	-	-	-	125	135	130
12	274	294	289	-	-	-
13	324	376	350	500	215	357.5
14	-	-	-	-	280	280
15	-	-	-	-	600	600
16	294	376	335	-	-	-
17	324	324	324			
19	284	284	284			
20	376	324	350			
21	-	524	524			

LACTATE DEHYDROGENASE (L.D.H.) CHANGES IN CALVES INFECTED WITH EAST COAST FEVER THEILERIA PARVA (MUGUGA) AND (AITONG) INFECTIONS (WARCKER UNITS-W.U)

FTER TION	T. PARVA (aitong) CALF NUMBERS E I	E 2	MEAN	T. PARVA (muguga) CALF NUMBERS E 3	E 4	MEAN
	549	370	459.5	477.3	373.1	425.2
	384	452	418	624	489	556.5
	576	610	593	625	525	575
	376	455	415.5	-	-	-
	-	-	-	604	447.5	525.8
	416	454	435	-	-	-
	329	354	341.5	712.5	543	627.8
	390	390	390	616	542.5	579.3
	336	373.5	356.3	589	621.5	605.3
	405	474	439.5	509	687.7	598.4
	540	596	568	582	630	606.0
	-	-	-	722.5	990	856.3
	945	1002	973	-	-	-
	1013	1013	1013	1115	660	887.5
	940	975	957.5	-	1175	1175
	975	975	975	-	1375	1375
	1100	1150	1125	-	-	-
	1200	1130	1165			
	1240	1200	1220			
	1180	1120	1150			
	-	1125	1125			

E 12

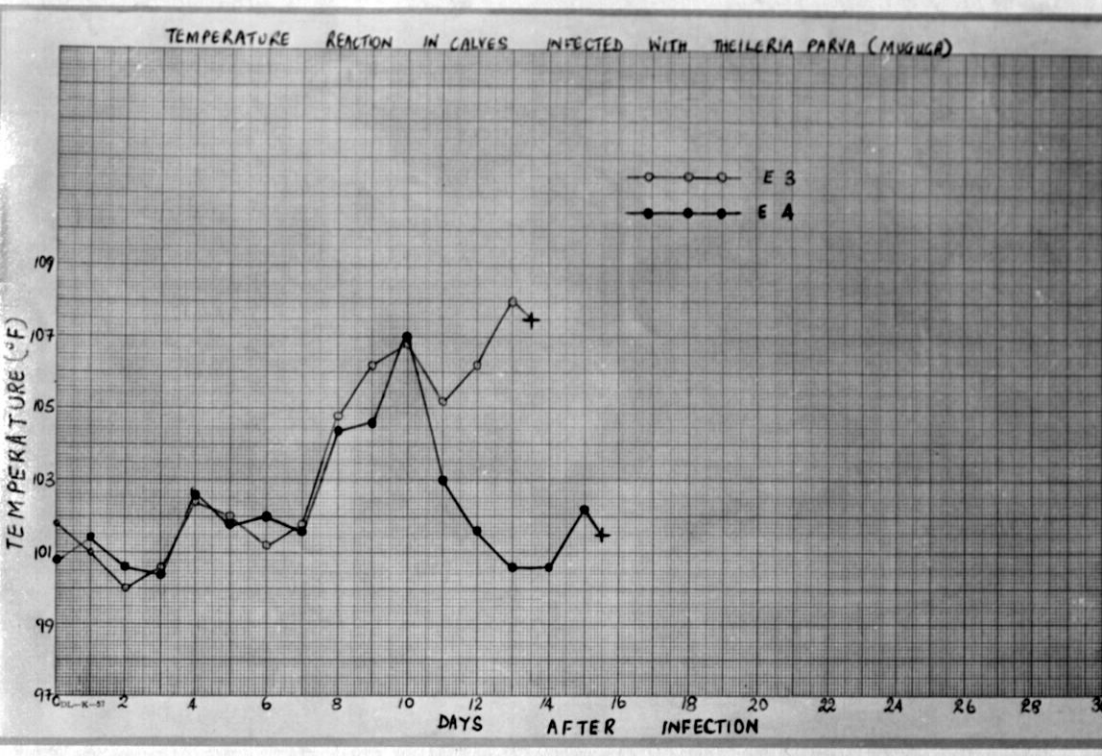
TOTAL BILIRUBIN (mg%) IN CALVES INFECTED WITH EAST COAST FEVER THEILERIA PARVA (MUGUGA) AND (AITONG) INFECTIONS

	T. PARVA (aitong)			T. PARVA (muguga)		
AYS AFTER INFECTION	CALF NUMBERS E I	E 2	MEAN	CALF NUMBERS E 3	E 4	MEAN
0	0.35	0.30	0.33	0.36	0.37	0.37
1	0.33	0.36	0.34	0.30	0.33	0.32
2	0.38	0.27	0.35	0.25	0.33	0.29
3	0.32	0.23	0.28	-	-	-
4	-	-	-	0.20	0.24	0.22
5	0.28	0.29	0.29	-	-	-
6	0.24	0.33	0.29	0.24	0.22	0.23
7	0.45	0.43	0.44	-	0.20	0.20
8	0.24	0.36	0.30	0.28	0.33	0.31
9	0.47	0.61	0.54	0.40	0.60	0.50
10	0.10	1.13	0.62	1.45	1.18	1.32
11	-	-	-	2.20	2.20	2.20
12	0.85	0.85	0.85	-	-	-
13	0.75	0.45	0.60	1.08	2.28	1.68
14	0.75	1.00	0.88	-	2.45	2.45
15	0.87	1.10	0.99	-	2.28	2.28
16	1.45	1.45	1.45			
17	1.32	1.54	1.43			
19	1.53	1.12	1.33			
20	2.51	2.27	2.39			
21	-	2.77	2.77			

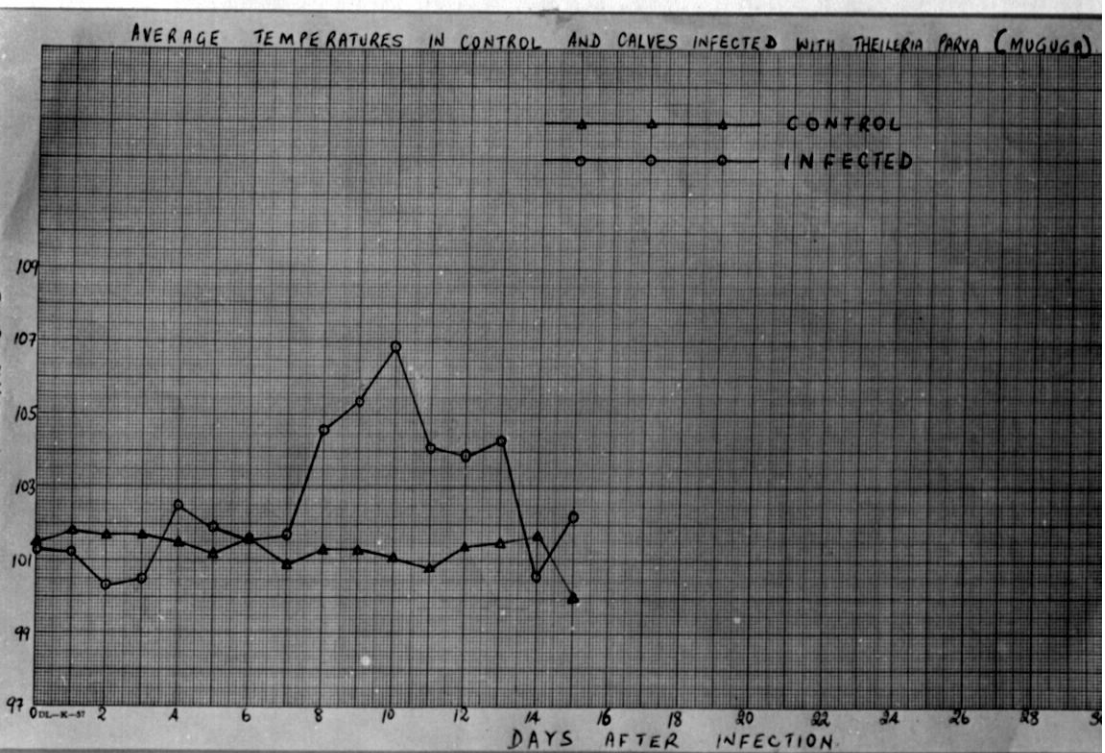
BLE 13

BLOOD UREA NITROGEN (BUN mg%) IN CALVES INFECTED WITH EAST COAST FEVER (E.C.F.) THEILERIA PARVA (MUGUGA) AND (AITONG) INFECTIONS

DAYS AFTER INFECTION	T. PARVA (aitong) CALF NUMBERS E I	E 2	MEAN	T. PARVA (muguga) CALF NUMBERS E 3	E 4	MEAN
0	<10	<10	<10	<10	<10	<10
1	<10	<10	<10	<10	<10	<10
2	<10	<10	<10	<10	<10	<10
3	<10	30	30	-	-	-
4	-	-	-	15	10	12.5
5	10	15	12.5	-	-	-
6	10	10	10	<10	<10	<10
7	10	10	10	25	15	20
8	10	15	12.5	15	20	17.5
9	10	15	12.5	<10	25	25
10	10	15	12.5	28	32	30
11	-	-	-	25	37	31
12	10	13	11.5	-	-	-
13	10	15	12.5	25	85	55
14	15	15	15	-	98	98
15	13	13	13	-	88	88
16	13	13	13	-	-	-
17	15	10	12.5			
19	20	15	17.5			
20	35	20	22.5			
21	-	25	25			



. I. Temperature reaction in two calves infected with Theileria parva (Muguga) stabilate 21.



g. 2. Thermogram of control and calves infected with Theileria parva (Muguga) stabilate 21.

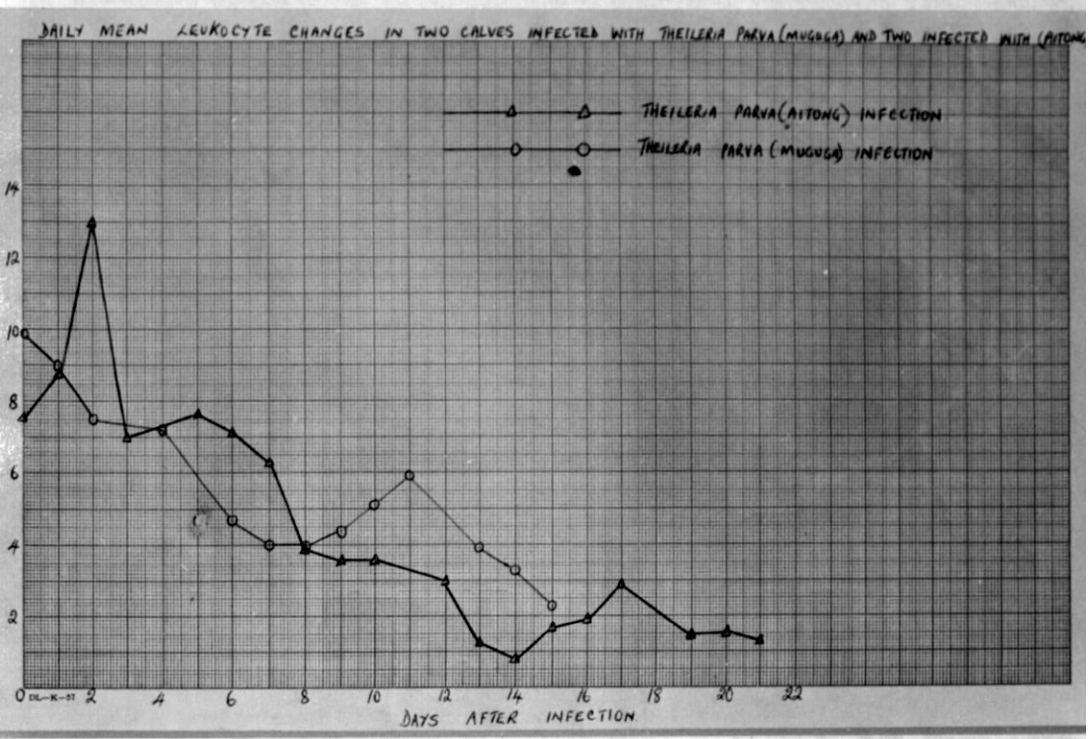


Fig. 3. Daily mean leukocyte changes in calves infected with Theileria parva (Muguga) and Theileria parva (Aitong).

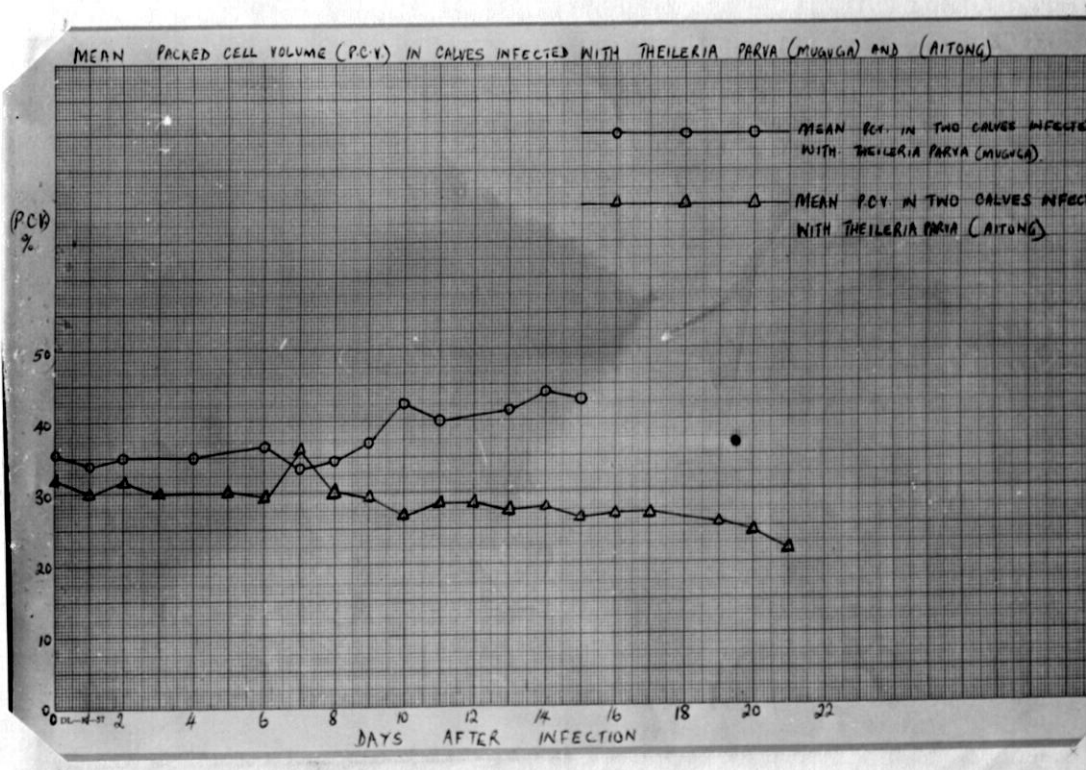


Fig. 4. Mean Packed cell volume (PCV) in two calves infected with Theileria parva (Muguga) and two infected with Theileria parva (Aitong).

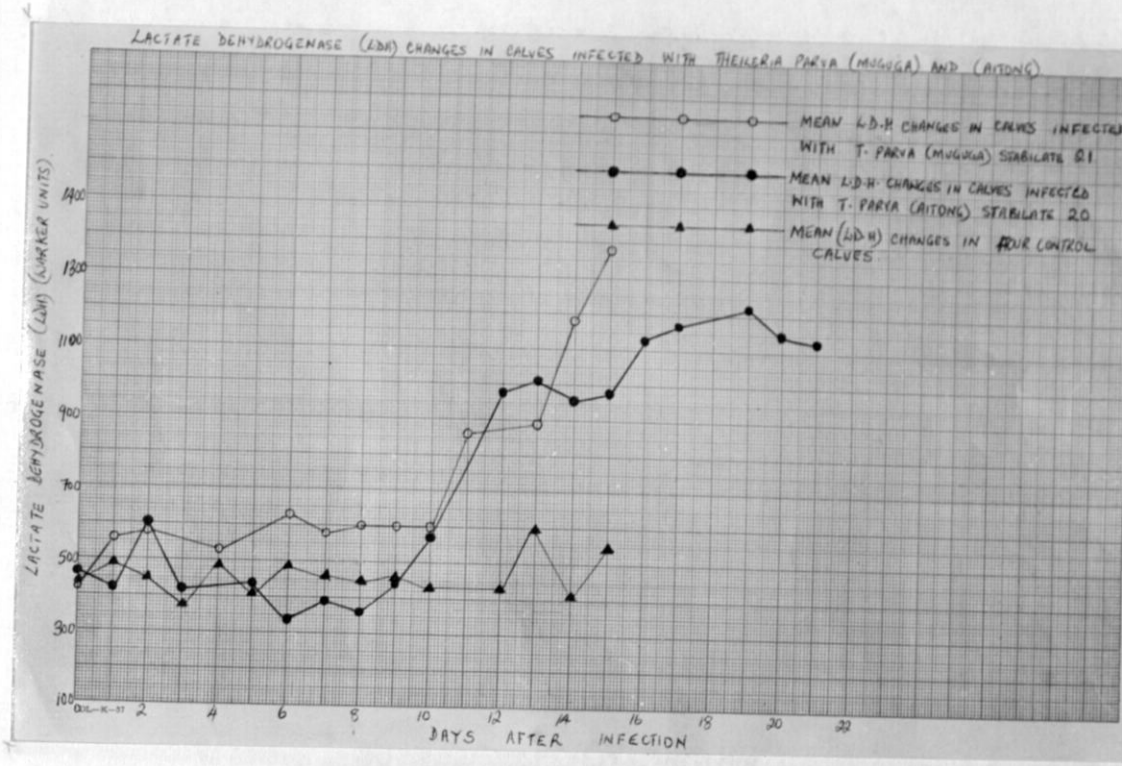


Fig. 5. Serum L.D.H. changes in calves infected with Theileria parva (Muguga) and Theileria parva (Aitong).

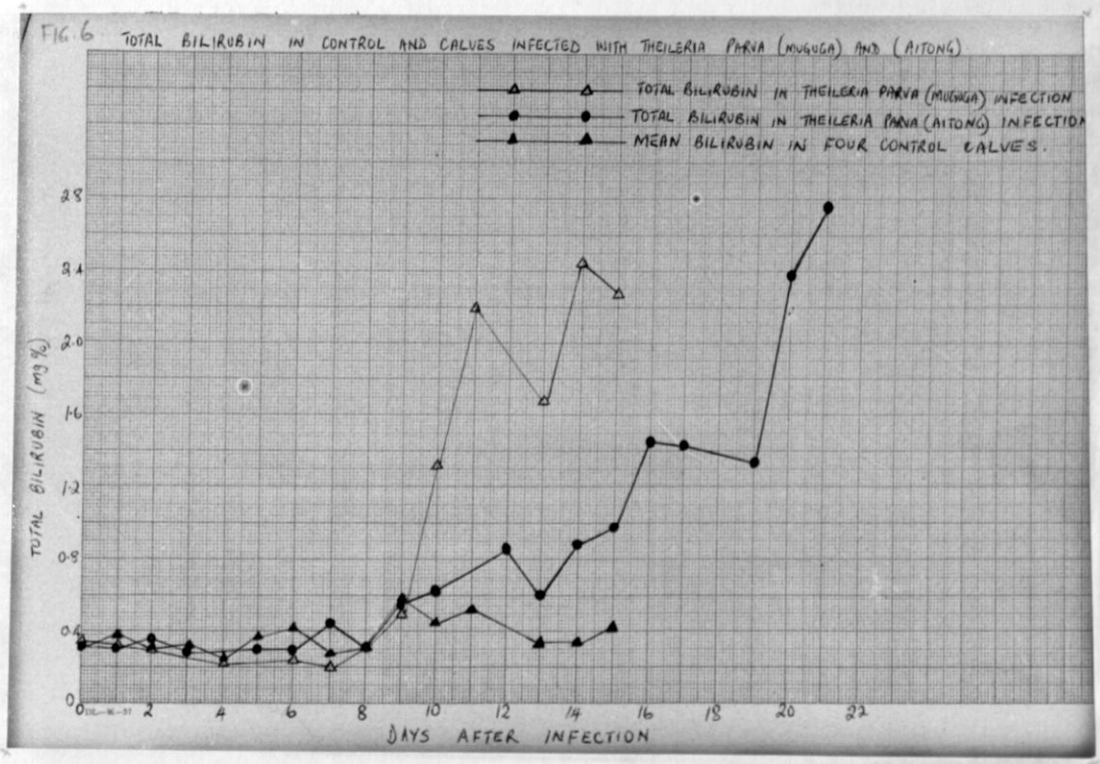


Fig. 6. Mean total bilirubin in control and calves infected with Theileria parva (Muguga) and (Aitong).

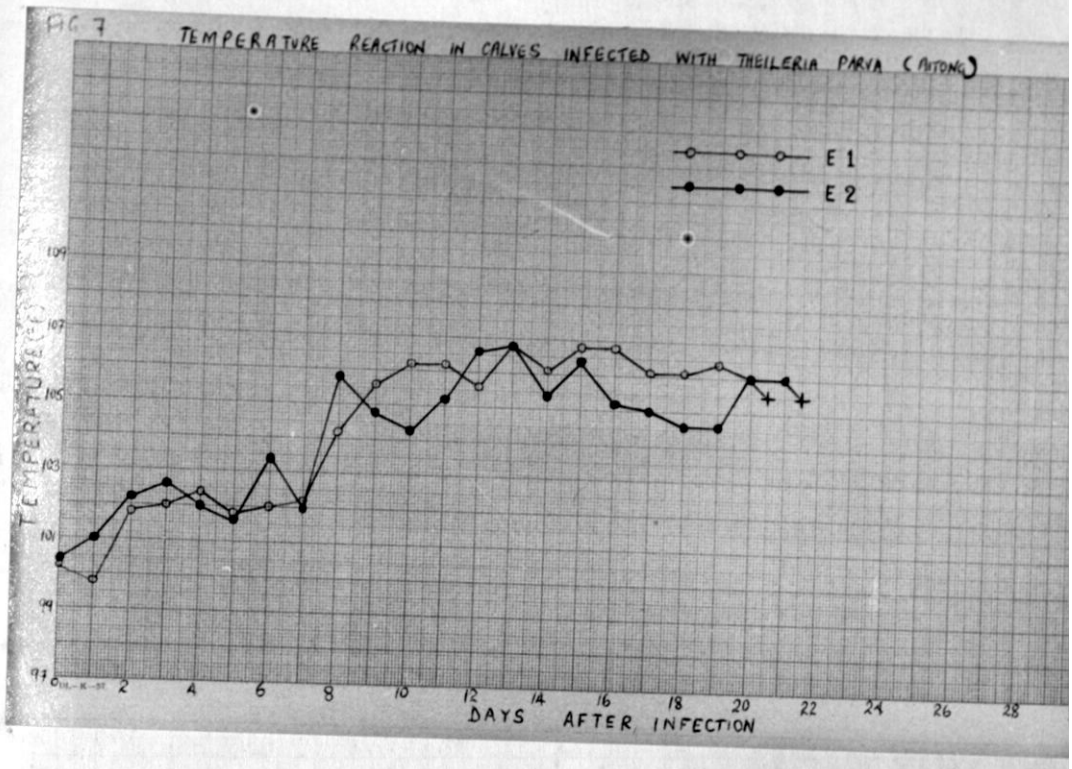


Fig. 7. Temperature reaction in two calves infected with Theileria parva (Aitong).

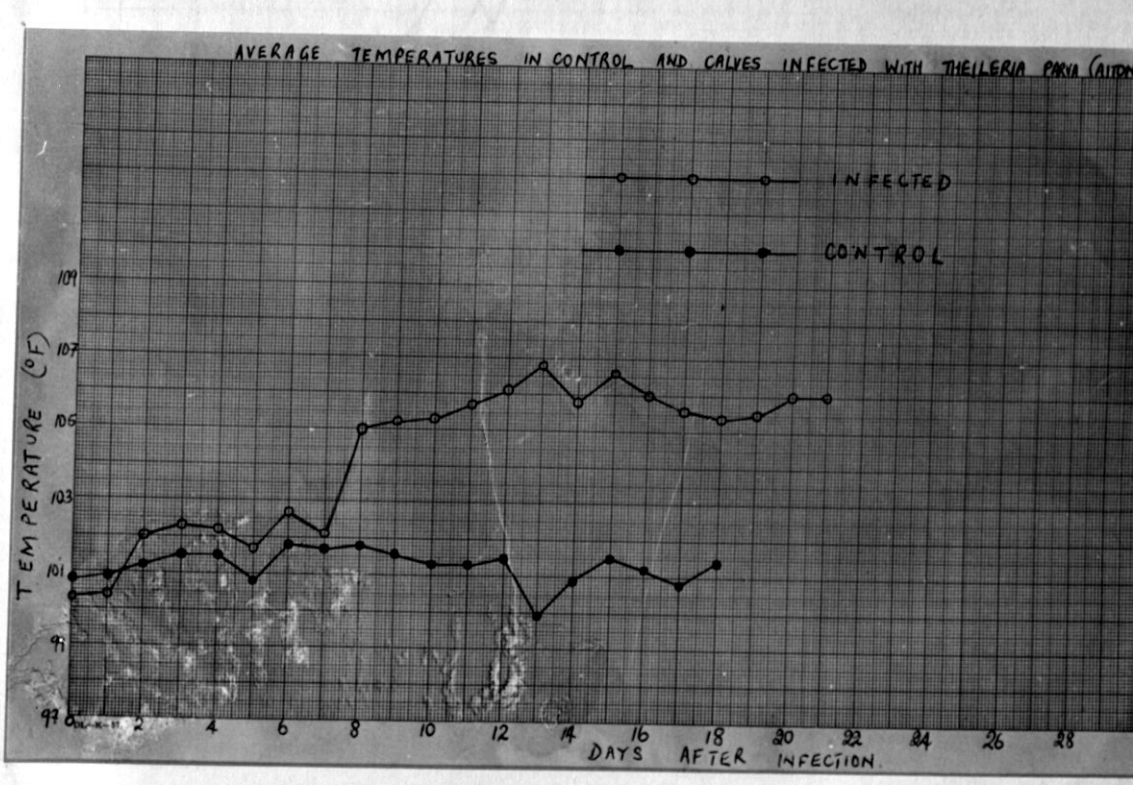


Fig. 8. Thermogram of two control and two infected calves in Theileria parva (Aitong) infection.

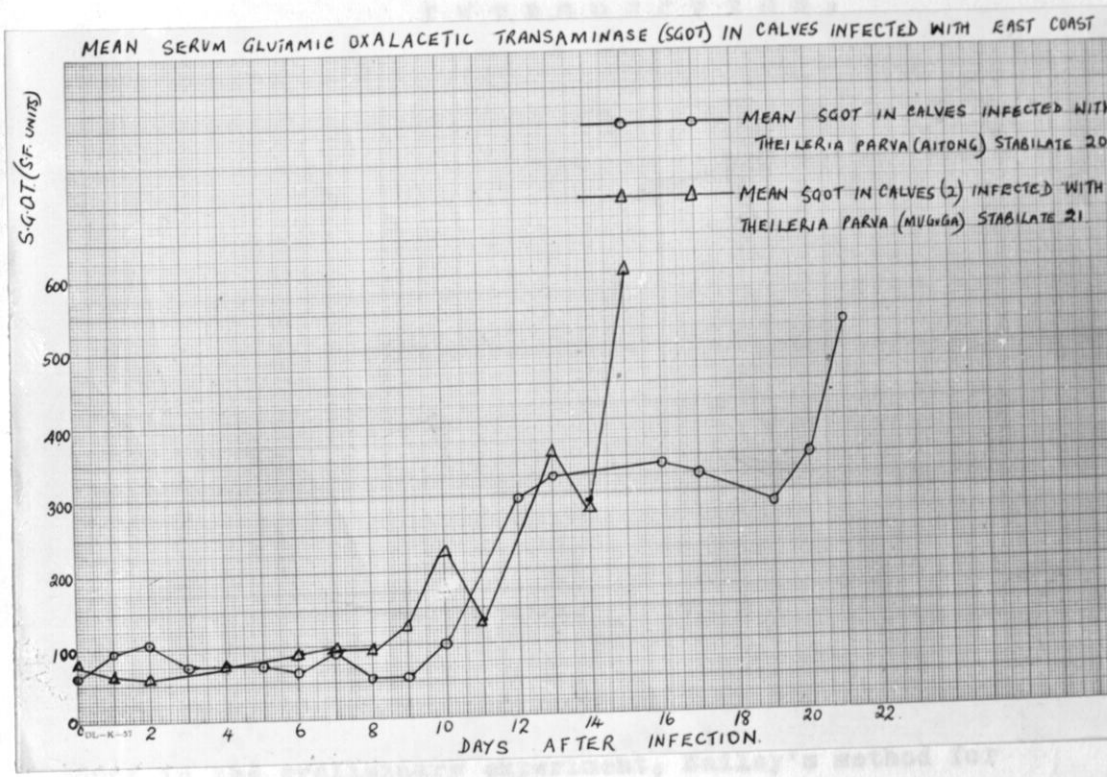


Fig. 9. Mean SGOT in two calves infected with Theileria parva (Muguga) and two sick with Theileria parva (Aitong).

EXPERIMENT 2:

INFECTIONS WITH THEILERIA PARVA (MUGUGA) STABILATE 44

I N T R O D U C T I O N :

The experiment was carried out in two parts. In the first part, five calves were infected with stabilate 44 undiluted while in the second, an equivalent number of calves were infected with the same stabilate diluted 1:10. This was done hoping that some calves would react mildly and possibly recover from the infection. Two control calves were used for each part.

Serum electrolytes were not determined in this experiment. Some other techniques were introduced. Due to the difficult experienced in doing a leukocyte differential count in the preliminary experiment, Bailey's method for concentrating microflariae was used with modification as described under materials and methods. The latter method was applied when difficulty was experienced in doing differential counts due to marked leukopenia.

Bromsulphthalein (BSP) test as described under materials and methods was done in some of the infected calves as well as in controls. This was added as a liver function test to investigate whether elevated SGOT and LDH levels were associated with decreased liver function.

E X P E R I M E N T 2 A

Theileria parva (muguga) stabilate 44 undiluted.

RESULTS:

Clinical Signs:

Some results are summarised on table 14. Incubation period averaged 9.3 days while mean reaction period was 10.4 days.

Swelling of the right lymph node was first noticed 2 days post-infection and macroschizonts were demonstrable from smears taken from the lymph node at a mean time of 5.6 days after infection i.e. about 4 days before temperature rise. Other peripheral lymph nodes became swollen 3 days after temperature rise.

In three out of five calves, lymph nodes regressed as the disease progressed but remained palpably enlarged in the rest of the calves.

Temperature remained high until death except in calf number 250 where temperature dropped to 98.2°F the day before the calf died (table 15).

The calves became dull with stary coats after temperature rise. Appetite remained good for a few days after the calves became sick but later it became depressed, anorexia being complete terminally. There was a definite loss of condition. Some of the calves became dehydrated (table 16, 17).

Two calves (tables 16, 17) developed an edematous swelling on the right side of the head below the ear. This swelling regressed afterwards in one calf (table 17).

This swelling was due to initial inflammatory reaction around the lymph node local to infection.

Respiratory rate increased with respirations becoming harsh on auscultation. A dry cough developed in all calves but time to development of the cough differed. One calf (table 18) developed a moist cough. There was an increased nasal discharge which was mucoid but in one calf became mucopurulent. No significant ocular discharge was noticed.

The pulse was rapid and later became weak in some calves (tables 17, 18,19). Petechiation of visible membranes was a late sign except in calf 258 (table 17).

Diarrhea when present was observed terminally. It was bloody in calf 258. Ruminal movements generally became weak as disease became more severe, and cessation occurred terminally. Shivering and grinding of teeth was observed in calf 258.

When the calves died froth exuded from the mouth and nostrils. Post-mortem examination was done on the dead calves. Impression smears taken from spleen, lymph nodes, lungs and liver were stained with Giemsa's stain. Presence of macroschizonts in the lymphocytes confirmed death from East Coast Fever. Piroplasms were also seen in blood smears taken from ear veins and stained with Giemsa's stain.

Haematology:

Macroschizonts were first seen in the local lymph node 4 days before the calves had temperature reaction (table 14). They were observed in other peripheral lymph nodes as temperature rose above 103°F. Piroplasms appeared in blood smears 2 days after temperature rose (table 14).

Macroschizont Indices (MSI%) and Piroplasm percentages are shown on tables 20 and 21 respectively. The calves which attained high MSI quickly died earlier. The calves which died early had relatively low piroplasm parasitaemia while those which lived longer attained high parasitaemia (upto 44%).

Panleukopenia was present in all infected calves (fig. 14). Drop in leukocytes generally began 3 days after rise of temperature (table 14). There is a correlation between the leukopenia and severity of the disease. Calves whose blood leukocytes were depleted very fast died earlier (Appendix 2B). When leukopenia became severe, only very occasional neutrophils and lymphocytes were noticeable on the on the blood smears. Both these cells also decreased in absolute values (table 24 and fig. 14).

Anemia was present especially in calves reacting beyond Day 18. This anemia was normocytic normochronic as the mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC) remained normal

(table 22). Except in calf 250, anemia occurred in calves which lived longest and achieved high piroplasm parasitaemia (table 20).

There was no change in platelet count (table 22).

Biochemistry:

There was a slight drop in total protein and A/G ratio charges indicate there was a decrese of globulin.

Alkaline phosphatase levels dropped slightly as can be seen from table 22 and Appendix 2A.

Serum glutamic oxalacetic transaminase (SGOT) went up three days after temperature rise (Temperature rise above 103°F occurred on the average on Day 9 table 14 and SGOT started going up after Day 12 (fig. 10) and continued until the calves died.

Lactate dehydrogenase had a similar pattern to that of SGOT (fig. 11). Levels in controls remained normal (Appendix 2A).

Bilirubin levels increased in all infected calves (table 36). Steep rise in total bilirubin occurred about 2 days before death. There was an increase in both conjugated and unconjugated bilirubin (tables 37 and 38). Increase in unconjugated bilirubin seems to be more pronounced in some calves (250, 258).

Blood Urea Nitrogen (BUN) did not have any significant change. It was only in three calves where it went slightly above normal (Appendix 2A).

Table 24 contains mean values of biochemical and haematological parameters measured in five infected calves. The raw data is in Appendix 2A and 2B.

Bromsulphaphthalein test (BSP) in two calves showed an increase in clearance time (fig. 15 and 16). This indicates decreased liver function.

TABLE 14

SUMMARY OF RESULTS IN 5 CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 (UNDILUTED)

ANIMAL NUMBER	I.F.A. TEST	DAYS TO MACROS IN REG.	DAYS TO MACROS IN LPG.	DAYS TO PIRO-PLASMS IN BLOOD	DAYS TO TEMPE-RATURE	DAYS TO DEATH	REACTION PERIOD	DAYS TO ENLAR-GED RPG(cm)	DAYS TO LEUKO-PENIA	DAYS TO DIARRHEA	DAYS TO HARSH RESPI-RATIONS	DAYS TO COUG
250	-ve	6	10	11	8	18	10	13	13	NONE	14	1
251	-ve	5	10	11	9	22	13	11	13	NONE	14	1
252	-ve	5	10	12	10	19	9	12	11	19	13	1
253	-ve	6	10	12	9	16	7	11	11	16	13	1
258	-ve	6	10	12	10	23	13	12	13	22	11	1
MEAN		5.6	10	11.6	9.2	19.6	10.4	11.8	12.2	19	13	1

Key:

I.F.A. - Indirect flurescent antibody test
MACROS - Macroschizont
REG. - Right Ear Gland
LPG - Left prescapular lymph node
RPG - Right prescapular gland

KEY TO TABLES 15, 16, 17, 18 AND 19

RPG - Right prescapular lymph node

M.M. - Mucous membranes

- PI - Pink
- PA - Pale
- PE - Petechiae

R.R. - Respiratory rate

R.S. - Respiratory sounds

- 0 - Normal
- 1 - Slightly harsh
- 2 - Harsh
- 3 - Very harsh (Dyspnea)

N.D. - Nasal Discharge

- \+ - Serous
- ++ - Mucoid
- +++ - Mucopurulent
- ++++ - Purulent

APP. - Appetite

- G - Good
- DE - Depressed
- A - Anorexia

DEHYD. - Dehydration

CONDITION: -

- F - Fair
- G - Good
- P - Poor

DEM. - Demeanor

- B - Bright
- D - Dull

COAT: -

- R - Stary
- SM - Smooth

O.D. - Ocular Discharge

- \+ - Serous
- ++ - Mucoid
- +++ - Mucopurulent
- ++++ - Purulent

RUMEN: -

- S - Strong
- W - Weak

TABLE 15

CALF 250

DAY	TEMP. °F	RPG cm.	PULSE RATE /min.	M.M.	R.R. /min.	R.S.	CLINICAL SIGNS: COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	100.8	1.8	60	PI	18	0	-	-	G	-	S	-	G	B	SM	-
1	101.2	2.0	60	PI	22	0	-	-	G	-	S	-	G	B	SM	-
2	101.4	2.0	60	PI	20	0	-	-	G	-	S	-	G	B	SM	-
3	101.2	2.0	70	PI	16	0	-	-	G	-	S	-	G	B	SM	-
4	100.4	2.0	60	PI	22	0	-	-	G	-	S	-	G	B	SM	-
5	102.4	2.0	64	PI	24	0	-	-	G	-	S	-	G	B	SM	-
6	100.6	2.0	64	PI	16	0	-	-	G	-	S	-	G	B	SM	-
7	101.0	2.0	80	PI	16	0	-	-	G	-	S	-	G	D	SM	-
8	102.4	2.0	56	PI	16	0	-	-	G	-	S	-	G	D	SM	-
9	104	1.8	64	PI	16	0	-	-	G	-	S	-	G	D	R	-
10	104.2	2.0	52	PI	20	0	-	-	G	-	S	-	G	D	R	-
11	105.4	2.0	64	PI	20	1	-	-	G	-	S	-	G	D	R	-
12*	105	2.2	76	PI	16	0	-	-	G	-	S	-	G	D	R	-
13	105.3	2.2	80	PI	20	0	-	++	G	-	S	-	G	D	R	-
14	105.8	2.2	80	PI	28	2	-	+	DE	-	W	-	G	D	R	-
15	106.3	2.3	84	PI	36	3	-	++	DE	-	W	-	G	D	R	-
16	107.0	2.3	92	PI	44	3	-	++	DE	-	W	-	F	D	R	-
17	105.6	2.4	92	PE	56	3	+	++	DE	-	W	+ve	P	D	R	-
18	98.2	2.4	76	PE	40	4	+	+++	DE	+	W	+ve	P	D	R	-
19	DEAD															

*Edematous Swelling on the right side below the ear

TABLE 16

CALF 251 - CLINICAL SIGNS

DAY	TEMP. °F	RPG cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	100	1.2	70	PI	20	0	-	-	G	-	S	-	G	B	SM	-
1	100.2	1.4	70	PI	18	0	-	-	G	-	S	-	G	B	SM	-
2	99.0	1.4	70	PI	18	0	-	-	G	-	S	-	G	B	SM	-
3	99.4	1.4	52	PI	20	0	-	-	G	-	S	-	G	B	SM	-
4	100.2	1.4	60	PI	20	0	-	-	G	-	S	-	G	B	SM	-
5	101.6	1.4	68	PI	24	0	-	-	G	-	S	-	G	B	SM	-
6	102.0	1.2	60	PI	16	0	-	-	G	-	S	-	G	B	SM	-
7	100.2	1.4	60	PI	16	0	-	-	G	-	S	-	G	B	SM	-
8	102.2	1.4	52	PI	12	0	-	-	G	-	S	-	G	B	SM	-
9	104.6	1.4	80	PI	16	0	-	-	G	-	S	-	G	D	SM	-
10	105	1.6	72	PI	16	0	-	-	G	-	S	-	G	D	SM	-
11*	105	1.8	72	PI	20	0	+	-	G	-	S	-	G	D	R	-
12	104.4	2.2	96	PI	20	0	+	-	G	-	S	-	G	D	R	-
13	105.4	2.3	68	PI	16	0	+	-	DE	-	S	-	G	D	R	-
14	104.7	2.2	80	PI	20	2	+	-	DE	-	S	-	G	D	R	-
15	104.9	2.0	76	PI	24	2	+	-	DE	-	S	-	P	D	R	-

* Swelling which later regressed

TABLE 16 CONTINUED

DAY	TEMP. °F	RPG Cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHD.	CONDITION	DEM.	COAT	O.D.
16	104.6	2.0	92	PI	24	2	+	+	DE	-	S	-	P	D	R	-
17	106	1.2	100	PI	32	3	+	++	DE	-	S	-	P	D	R	-
18	104	1.2	100	PI	32	3	+	++	DE	-	W	-	P	D	R	-
19	105.2	1.2	100	PA	32	3	+	++	DE	-	W	-	P	D	R	-
20	105.1	1.0	92	PA	52	3	+	++	DE	-	W	+ve	P	D	R	-
21	105.6	1.0	120	PA	52	3	+	+++	DE	-	W	+ve	P	D	R	-
22	105.4	1.0	130	PA+PE	56	3	+	++	DE	-	W	+ve	P	D	R	-
23	DEAD															

TABLE 17

CALF 252 - CLINICAL SIGNS

DAY	TEMP. °F	RPG Cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	101	1.8	70	PI	20	1	-	-	G	-	S	-	G	B	SM	-
1	100.4	1.8	52	PI	20	1	-	-	G	-	S	-	G	B	SM	-
2	101.2	2.0	60	PI	20	1	-	-	G	-	S	-	G	B	SM	-
3	100.6	2.0	60	PI	18	1	-	-	G	-	S	-	G	B	SM	-
4	100.0	2.0	60	PI	18	1	-	-	G	-	S	-	G	B	SM	-
5	102.2	2.0	72	PI	24	0	-	-	G	-	S	-	G	B	SM	-
6	100.4	1.8	52	PI	16	1	-	-	G	-	S	-	G	B	SM	-
7	100.6	2.0	72	PI	16	1	-	-	G	-	S	-	G	B	SM	-
8	100	2.0	52	PI	16	I	+	-	G	-	S	-	G	B	SM	-
9	102.4	2.0	72	PI	20	2	+	-	G	-	S	-	G	B	SM	-
10	104.0	2.0	60	PI	20	0	+	-	G	-	S	-	G	D	R	-
11	105.1	2.0	68	PI	16	0	+	-	G	-	S	-	G	D	R	-
12	105.6	2.2	64	PI	24	0	+ moist	-	G	-	S	-	G	D	R	-
13	104.9	2.2	64	PI	32	2	+	++	G	-	W	-	G	D	R	-
14	105.3	2.2	64	PI	24	2	+	+	DE	-	W	-	G	D	R	-
15	106.1	2.3	72	PI	20	3	+	+	DE	-	S	-	G	D	R	-
16	106.6	2.0	64	PI	20	3	+	-	DE	-	S	-	G	D	R	-
17	107.8	1.8	92	PI	24	3	+	++	DE	-	S	-	F	D	R	-
18	106.0	1.8	80	PI	24	3	+	++	DE	-	S	-	F	D	R	-
19	107.0	1.8	84	PE	36	3	+	++	DE	+	S	-	F	D	R	-
20	DEAD															

TABLE 18 CALF 253 - CLINICAL SIGNS

DAY	TEMP. °F	RPG Cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	101.4	1.8	68	PI	20	0	-	-	G	-	S	-	G	B	SM	-
1	99.8	1.8	52	PI	16	0	-	-	G	-	S	-	G	B	SM	-
2	100.4	2.0	56	PI	20	0	-	-	G	-	S	-	G	B	SM	-
3	100.4	2.0	60	PI	24	0	-	-	G	-	S	-	G	B	SM	-
4	100.1	2.0	52	PI	16	0	-	+	G	-	S	-	G	B	SM	-
5	101.4	2.0	60	PI	20	0	-	+	G	-	S	-	G	B	SM	-
6	100.6	2.0	60	PI	16	0	-	+	G	-	S	-	G	B	SM	-
7	100.4	2.0	60	PI	16	0	-	-	G	-	S	-	G	B	SM	-
8	102.4	2.0	60	PI	20	0	-	-	G	-	S	-	G	D	SM	-
9	104.6	1.8	60	PI	20	1	-	+	G	-	S	-	G	D	SM	-
10	105.2	2.0	60	PI	20	0	-	-	G	-	S	-	G	D	R	-
11	105.1	2.2	68	PI	24	0	-	-	G	-	S	-	G	D	R	-
12	104.9	2.4	80	PI	24	1	-	-	G	-	S	-	G	D	R	-
13	107.8	2.4	72	PE	20	2	-	-	DE	-	W	-	G	D	R	-
14	106.3	2.4	80	PE	24	2	+ dry	+	DE	-	W	-	G	D	R	-
15	105.8	2.2	100	PE	24	3	dry	++	DE	-	W	-	G	D	R	-
16	106.0	2.2	100	PE	28	3	dry	++	A	-	W	-	G	L	R	-
17	DEAD															

TABLE 19 CALF 258 - CLINICAL SIGNS

DAY	TEMP. °F	RPG Cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	101	1.8	60	PI	22	0	-	-	G	-	S	-	G	B	SM	-
1	100	2.0	60	PI	24	0	-	-	G	-	S	-	G	B	SM	-
2	100	2.0	60	PI	32	0	-	-	G	-	S	-	G	B	SM	-
3	99.2	2.0	60	PI	24	0	-	-	G	-	S	-	G	B	SM	-
4	99.0	2.0	52	PI	24	0	-	-	G	-	S	-	G	B	SM	-
5	102	2.0	56	PI	24	0	-	-	G	-	S	-	G	B	SM	-
6	99.4	2.0	56	PI	12	0	-	-	G	-	S	-	G	B	SM	-
7	101	2.0	56	PI	16	0	+	-	G	-	S	-	G	B	SM	-
8	101.2	2.0	52	PI	16	1	+	-	G	-	S	-	G	B	SM	-
9	101	2.0	60	PI	20	1	+	-	G	-	S	-	G	D	R	-
10	105.6	2.1	68	PI	20	0	+	-	G	-	S	-	G	D	R	-
11	105	2.2	68	PI	24	1	+	-	G	-	S	-	G	D	R	-
12	105	2.4	80	PI	28	1	+	-	G	-	S	-	G	D	R	-
13	105.2	2.4	76	PE	24	2	dry + moist	-	DE	-	W	-	G	D	R	-
14*	105.3	2.4	84	PE	32	2	+ moist	-	DE	-	W	-	G	D	R	-
15	105.4	2.4	84	PE	24	2	+ moist	-	DE	-	W	-	G	D	R	-

* Shivering and Grinding teeth

TABLE 19 CONTINUED

DAY	TEMP. °F	RPG Cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
16	106.4	2.4	92	PE	32	2	+	-	DE	-	W	-	F	D	R	-
17	106	2.3	92	PE	32	3	+	-	DE	-	W	-	F	D	R	-
18	104.9	2.2	80	PE	32	3	+	-	DE	-	W	-	F	D	R	-
19	105	2.2	80	PE	40	3	+	-	DE	-	W	-	F	D	R	-
20	104.8	2.3	92	PE	44	3	+	-	DE	-	W	-	F	D	R	-
21	105.4	2.2	92	PE	52	3	+	++	DE	-	W	-	F	D	R	-
22	106.2	2.1	104	PE	56	3	+	++	DE	+blood	W	-	F	D	R	-
23	104.2	2.0	104	PE	44	3	+	++	A	+	W	-	F	D	R	-
24	DEAD															

TABLE 20

PIROPLASM PERCENTAGE IN CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 UNDILUTED

DAYS AFTER INFECTION	CALF NUMBERS				
	250	251	252	253	258
11	+	+	+	-	-
12	0.50	1.25	2.5	0.75	1.50
13	6.00	1.50	-	1.00	-
15	6.00	4.00	7.5	9.00	7.00
16	13.0	13.0	11	16	14.0
17	15	18.0	15	-	23
18	18	21	23	-	25
20	-	27	-	-	38
21	-	33	-	-	43
22	-	43	-	-	44

TABLE 21

MACROSCHIZONT INDEX (MSI) IN CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 UNDILUTED

DAYS AFTER INFECTION	CALF NUMBERS				
	250	251	252	253	258
10	0.25	-	-	-	-
11	0.75	3.50	1.8	1.5	1.3
12	0.75	8.00	4.00	11.00	-
13	8	13.5	25	32	9
14	16	18	42	36	10
15	45	55	52	57	25

TABLE 21 CONTINUED

DAYS AFTER INFECTION	CALF NUMBERS				
	250	251	252	253	258
16	56	42	62	61	27
17	69	45	72	-	32
18	71	50	76	-	18
20	-	40	-	-	11
21	-	44	-	-	-
22	-	51	-	-	-

TABLE 22

PRE-INFECTION AND POST-TEMPERATURE RISE MEANS AND STANDARD DEVIATIONS OF BIOCHEMICAL AND HAEMATOLOGICAL CHANGES IN 5 CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44

	PRE-INFECTION LEVELS			POST-TEMPERATURE RISE LEVELS		
PARAMETER	N	MEAN	SD.	N	MEAN	SD.
TOTAL PROTEIN Gm%	40	6.68	±0.38	30	5.97	±0.56
A/G RATIO	40	0.71	±0.13	30	0.87	±0.19
ALKALINE PHOSPHATASE (SIG. UNITS)	40	3.34	±2.62	30	1.39	±0.82
P.C.V.	40	30.85	±2.04	30	25.0	±4.59
M.C.V.	40	44.3	±2.76	30	45.0	±2.63
MCHC	40	33.4	±1.03	30	33.6	±1.71
R.B.C./Cmm. x 10^6	40	7.00	±0.57	30	5.56	±0.83
H.B. (Gm%)	40	9.72	±1.52	30	8.41	±1.68
PLATELETS /Cmm x 10^3	40	436.7	±166.3	27	460.4	±225.47

TABLE 23

INDIRECT BILIRUBIN IN CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 UNDILUTED

DAYS AFTER INFECTION	CALF NUMBERS					AVERAGE
	250	251	252	253	258	
0	0.21	0.12	0.21	0.18	0.17	0.18
1	0.16	0.06	0.03	0.02	0.06	0.07
2	0.10	0.10	0.10	0.10	0.10	0.10
4	-	0.15	0.09	0.08	0.18	0.13
6	0.14	0.20	0.15	0.18	0.15	0.16
9	0.12	0.10	0.19	0.20	0.20	0.16
11	0.12	0.10	0.15	0.10	0.08	0.11
13	0.19	0.15	0.10	0.20	0.10	0.15
15	0.20	0.05	0.05	0.40	0.15	0.17
17	0.24	0.05	0.15	-	0.25	0.17
18	0.67	0.22	0.18	-	0.57	0.41
20	-	0.05	-	-	0.70	0.38
22	-	0.20	-	-	2.37	1.29

TABLE 24

SUMMARY OF THE MEAN VALUES OF SOME BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS MEASURED IN 5 CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 UNDILUTED

DAYS AFTER INFECTION	WBC /Cmm x 10^3	LYMP. /Cmm x 10^3	NEUT. /Cmm x 10^3	SGOT S.F. UNITS	L.D.H. W.U.	T.B. mg %	D.B. mg %	I.D. mg %
0	9.45	7.20	2.11	85.1	596.0	0.26	0.07	0.18
1	9.08	6.78	2.16	81.2	528.4	0.17	0.11	0.07
2	9.00	6.90	1.94	77.6	478.0	0.19	0.09	0.10
4	8.96	7.06	1.62	85.0	531.6	0.19	0.07	0.13
6	9.12	6.94	1.90	75.2	670.0	0.22	0.06	0.16
8	9.58	7.50	2.45	68.6	556.4	0.18	-	-
9	8.78	6.68	3.18	67.4	597.2	0.22	0.06	0.16
11	4.82	4.12	1.02	68.2	619.2	0.16	0.05	0.11
13	2.22	1.98	0.78	158	1023.6	0.19	0.05	0.15
15	0.98	1.10	0.18	334	1399.2	0.50	0.23	0.17
17	1.00	1.00	0.25	333	1312.0	0.43	0.26	0.17
18	1.73	1.23	0.20	373	1337.0	0.67	0.25	0.41
20	1.30	0.95	0.35	412	1386.0	0.82	0.44	0.38
22	1.30	-	-	600	-	1.68	0.39	1.29

TABLE 25

SUMMARY OF THE MEAN VALUES OF SOME BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS MEASURED IN 2 CONTROL CALVES IN THEILERIA PARVA (MUGUGA) UNDILUTED STABILATE 44 INFECTION

DAYS AFTER INFECTION	WBC /Cmm x 10^3	LYMP. /Cmm x 10^3	NEUT. /Cmm x 10^3	SGOT S.F. UNITS	L.D.H. W.U.	T.B. mg %	D.B. mg %
0	12.47	8.43	3.89	89.0	522.2	0.38	0.14
1	11.20	7.35	3.85	76.0	534.0	0.30	0.17
2	14.85	10.4	4.40	92.5	581.0	0.33	0.15
4	11.30	8.45	2.75	89.5	563.0	0.40	0.12
6	12.40	8.70	3.65	79.5	568.0	0.28	0.09
8	12.95	8.65	4.30	67.0	590.0	0.32	-
9	17.90	13.10	5.00	76.0	614.0	0.31	0.09
11	14.50	9.20	5.30	80.0	564.0	0.20	0.10
13	12.45	8.70	3.75	79.0	518.0	0.20	0.13
15	11.35	7.25	4.10	85.0	589.5	0.37	0.21
17	13.00	8.90	4.05	80.0	544.0	0.28	0.15
20	11.55	7.30	3.35	76	492	0.30	0.18
21	7.30	4.80	2.50	85	-	o.16	0.13

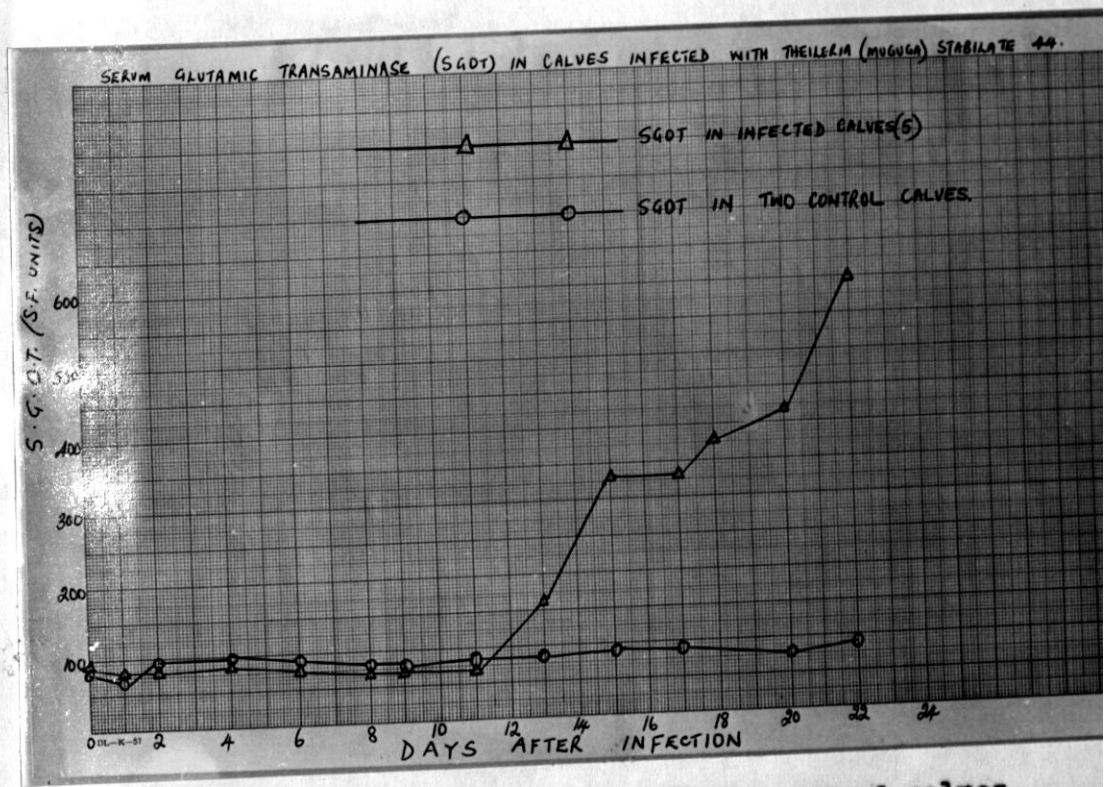


Fig. 10. Mean SGOT in five infected and two control calves, Theileria parva (Muguga) stabilate 44 undiluted.

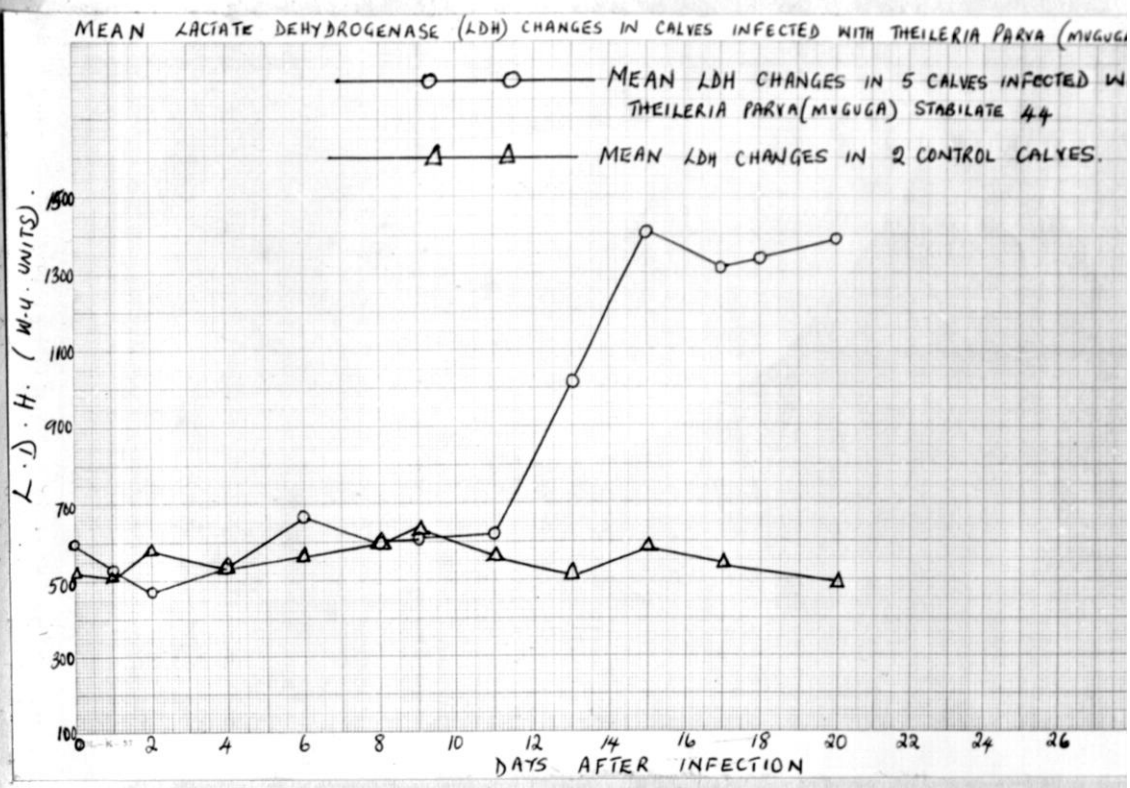


Fig. 11. Mean serum LDH changes in five infected and two control calves used in Theileria parva (Muguga) stabilate 44 undiluted.

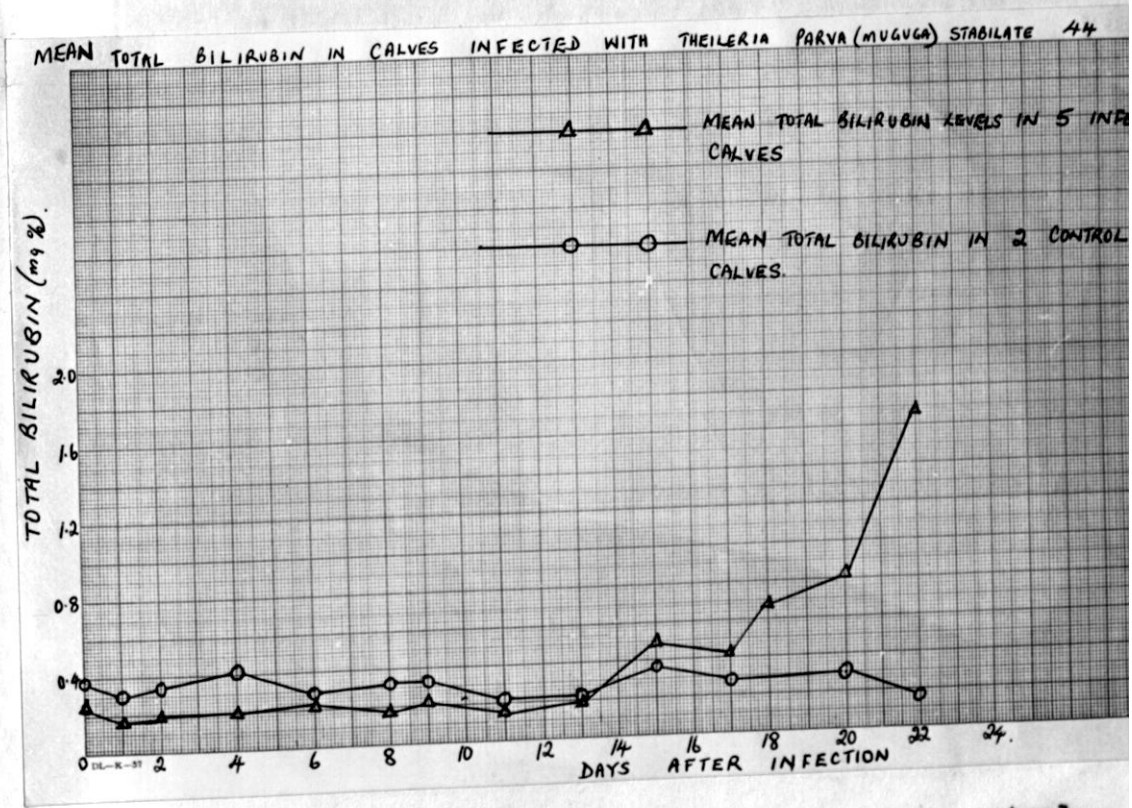


Fig. 12. Mean total bilirubin in five infected and two control calves - Theileria parva (Muguga) stabilate 44 undiluted.

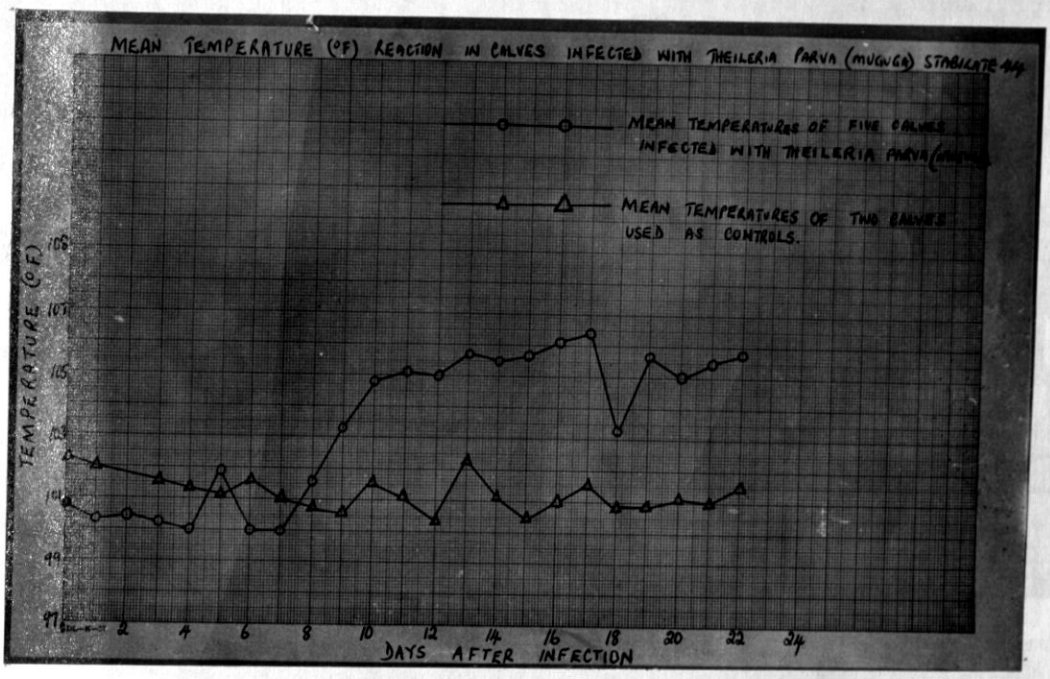


Fig. 13. Thermogram of infected and control calves - Theileria parva (Muguga) undiluted stabilate 44 infection.

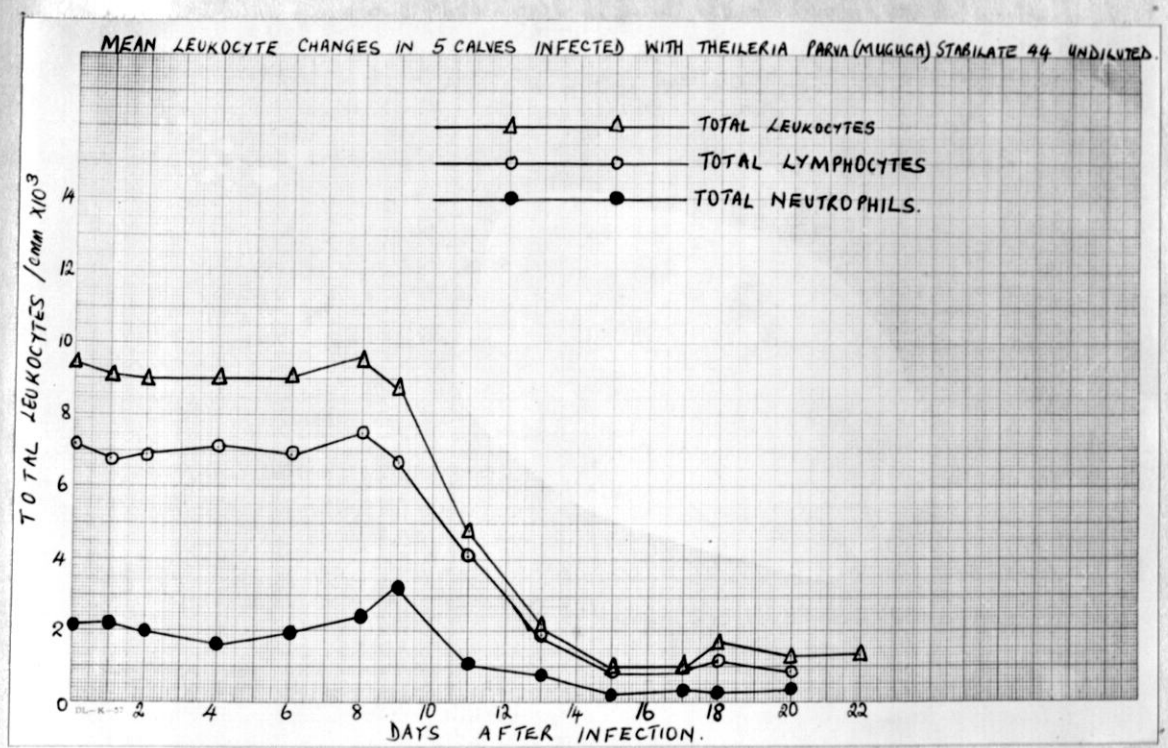


Fig. 14. Leukocyte changes in five calves infected with Theileria parva (Muguga) stabilate 44 undiluted.

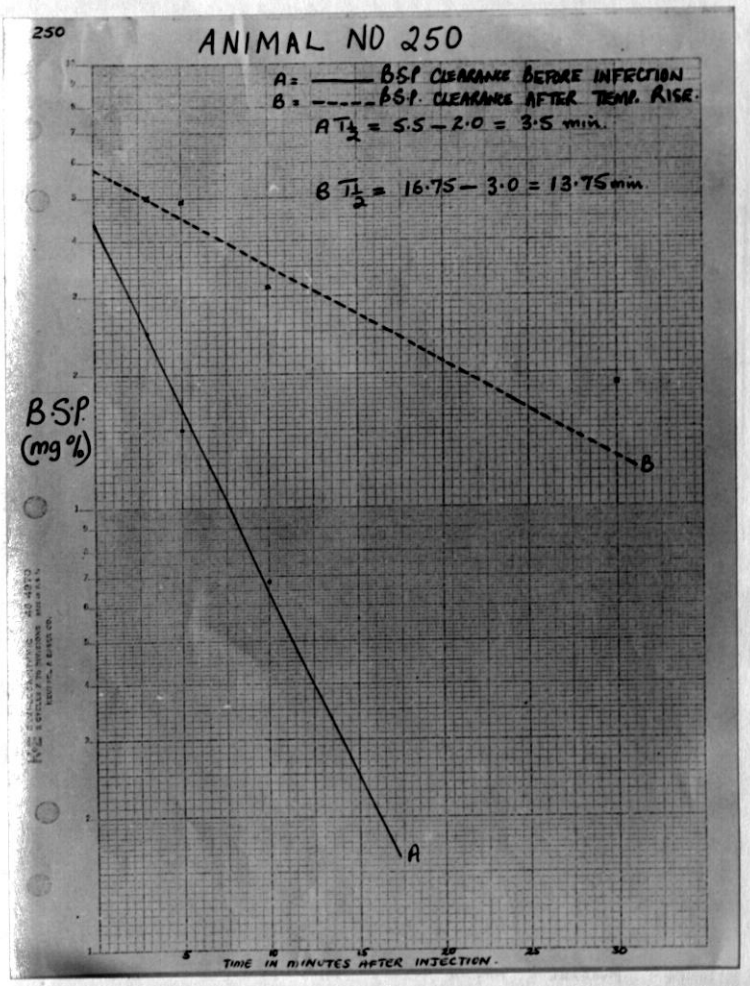


Fig. 15. B.S.P. clearance in calf 250. Clearance time increased by 10.25 minutes.

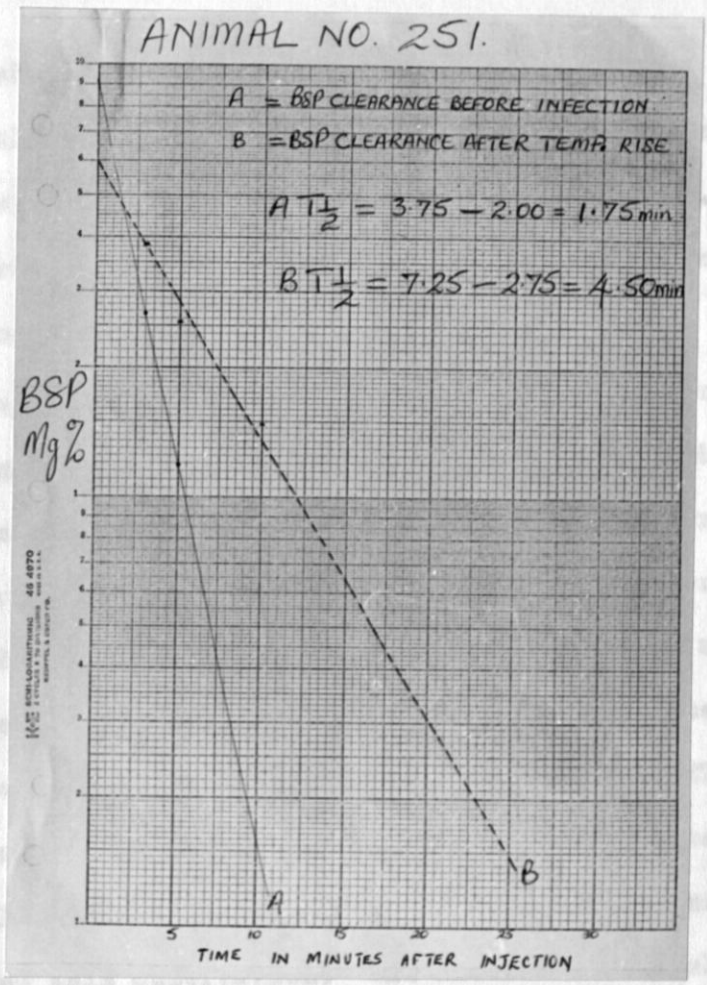


Fig. 16. B.S.P. Clearance in calf 251. Clearance time increased by 2.75 minutes.

EXPERIMENT 2B - THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO

Clinical Signs:

Table 26 summarizes results of the infected calves. Three calves recovered from the infection. The incubation period varied between 11-14 days (Mean 12.2 days). Temperature rise was preceded by macroschizonts in right parotid lymph node (table 26).

The surviving calves reacted mildly. The only noticeable signs were the elevation of temperature, lymph node enlargement, dullness and stary coats. Temperature went up temporarily and then dropped as the calves recovered (table 27 and figure 17). The prescapular lymph node also regressed (table 28) to normal. The calves became bright when recovery occurred. One of the calves (No. 279) developed anemia during the reaction period. This was detectable clinically by the pale mucous membrane while haematology supported this observation. The anemic calf developed a weak rapid pulse which became normal after recovery.

The dying calves (254 and 257) developed severe signs. With temperature reaction, these calves became dull and had stary coats (table 29 and 30). Reduced appetite was evident a few days after temperature rise and anorexia was complete terminally. Calf 257 developed an edematous swelling on the right side of the head, starting just below the ear. The swelling later extended down into

the intermandibular space. Afterwards this swelling regressed. These two calves became progressively weak especially in the hindquarters and this added to the loss of condition observed afterwards, contributed to incoordination and eventual recumbency.

Increased nasal discharge was present in both calves. The nasal discharge originally mucoid developed into mucopurulent discharge when disease became more severe. Hypersalivation was observed when the calves became extremely ill. Saliva became sticky in one calf and halitosis was noticeable.

Respiration became accelerated and harsh. Later the calves developed dyspnea. Coughing was present when calves became noticeably sick. The cough later became moist, in calf 254.

There was no diarrhea. In fact, faeces became firmer as disease became more serious. Ruminal contractions became weak and suppressed.

The pulse became rapid. Petechial haemorrhages were seen when the calves were about to die.

Dehydration was present in calf 254 as was indicated by sunken eyeballs and the skin becoming less elastic.

The surviving calves (255, 278, 279) were later splenectomized to see whether they would come down with East Coast Fever. Two calves (255, 278) did not get sick except that they tired quickly on exercise. Calf 279

afterwards however died of acute babesiosis.

Haematology:

Leukopenia developed in all the sick calves (tables 31 and 32). It was severe and progressive in dying calves but was mild and reversible in recovering calves (fig. 18). The lowest mean leukocyte count of recovering calves was 4.80 WBC/cmm x 10^3 (table 33).

Slight anemia was present in infected calves with haematocrit dropping slightly (tables 31 and 32). Anemia was intense in calf 279 where P.C.V. came as low as 17%. Anisocytosis with significant macrocytosis was present in blood smears made from this calf. Mean corpuscular Volume (M.C.V.) was increased (appendix 3B) which supports the finding of macrocytes on blood smears.

Macroschizont indices (MSI%) are shown on table 35. M.S.I. for recovering calves (255, 278, 279) reached a peak and fell gradually as they recovered until they were no longer detectable. In the dying calves M.S.I. attained high levels until death occurred.

Piroplasm parasitaemia did not go up very high. The highest of 19% was atteined by calf No. 254. The recovering calves had piroplasms in the blood during and shortly after the temperature reaction period. After recovery, the piroplasms were no longer seen in blood (table 36).

Biochemistry:

There was very slight elevation of serum glutamic oxalacetic transaminase (SGOT) in calves which eventually recovered (table 31 and fig. 20). This slight rise in SGOT was corrected when calves recovered. SGOT in dying calves became markedly elevated (table 32 and fig. 20). The steep rise started about two days after temperature rise (the latter went up on average, Day 12 - table 26). Figure 19 shows SGOT changes in all the infected calves compared with changes in control calves.

Lactate Dehydrogenase (LDH) had almost similar changes as SGOT. Mean LDH changes are presented on table 33 and 34 and figure 21. The latter figure shows a rise of LDH levels to a maximum and then a fall back to normal. Considering table 32 and figure 22, the steep rise in LDH levels can be attributed to the calves which died. There was no change in LDH levels of the calves which reacted mildly (table 31). The steep rise also followed the temperature reaction (Temperature went up on average, Day 12).

A consistent slight decrease in alkaline phosphatase occurred in all the dying calves (table 32).

Bilirubin levels had a sudden rise a few days before death in the calves which reacted severely. Those calves which recovered showed slight elevation in bilirubin values (fig. 25). Mean total bilirubin values of all infected and control calves are shown on figure 23.

Total protein, albumin, globulin and albumin-globulin ratio (A/G) values were not altered significantly (tables 31 and 32). Blood urea nitrogen (BUN) levels were also not affected.

Bromsulfophthalein (BSP) clearance time increased considerably in the two calves with severe disease but no significant change was noticed in BSP clearance in calves which reacted mildly except in calf number 278 where clearance increased by six minutes (figures 25 - 30).

TABLE 26

SUMMARY OF RESULTS IN 5 CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO

ANIMAL NO.	I.F.A. TEST	DAYS TO MACROS. IN REG.	DAYS TO TEMP. (103°F)	DAYS TO DROP OF TEMP.	DAYS TO DEATH	REACTION PERIOD	DAYS TO MACROS. (LPG)	ABSENCE OF MACROS IN LPG.	DAYS TO PIROS. IN BLOOD	ABSENCE OF PIROS. IN BLOOD	RESULT
254	-ve	9	11	-	22	11	11	-	14	-	DEAD
255	-ve	8	10	16	-	7	11	26	14	26	RECOVERED
257	-ve	9	12	-	22	10	13	-	15	-	DEAD
278	-ve	8	14	15	-	2	13	23	15	21	RECOVERED
279	-ve	8	14	20	-	7	13	20	15	28	RECOVERED
MEAN		8.4	12	17	22		12.2	23	14.6	25	

MACROS. - Macroschizont
REG. - Right ear gland
TEMP. - Temperature
PIROS. - Piroplasms
I.F.A. - Indirect Fluorescent Antibody

TABLE 27

TEMPERATURES OF 3 CALVES WHICH SURVIVED THEILERIA PARVA (MUGUGA) STABILATE 44 INFECTION (I:IO DILUTION)

DAYS AFTER INFECTION	CALF NUMBERS			
	255	278	279	MEAN
0	101.6	100.4	99.1	100.4
1	100.4	101.5	101.3	101.1
2	100.0	101.7	99.7	100.5
3	100	100.8	99.9	100.2
4	100	101.7	101.3	101
5	99.9	102.2	100.6	100.6
6	99.9	101	100	100.3
7	101.6	101	100.6	101.1
8	99.9	100.2	100.8	100.3
9	100	100.8	100	100.3
10	103	101.2	100.4	101.5
11	103.4	101.4	100.2	101.7
12	102.7	102.7	100.2	101.9
13	102.6	102.8	102.0	102.5
14	104.4	103.5	104	104.0
15	103.1	103.3	104	103.5
16	103.1	102.2	104	103.1
17	100.8	102.2	105.3	102.8
18	100.9	100.8	104	101.9
19	101.8	101.1	104.6	102.5

TABLE 27 CONTINUED

DAYS AFTER INFECTION	CALF NUMBERS 255	278	279	MEAN
20	100.9	100.8	103.5	101.7
21	101.5	102.2	102.6	102.1
22	100.5	99.7	102.4	100.9
23	100.4	100.8	101.3	100.8
24	100.4	101.3	101.5	101.1
25	100.4	101.8	101.5	101.2
26	101.5	102.4	100.8	101.6
27	101.7	101.8	100.4	101.3
28	100.4	100.9	99.2	100.2

TABLE 28

CHANGES IN SIZE OF RIGHT PRESCAPULAR LYMPH NODE IN 3 CALVES THAT RECOVERED FROM THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO (Cm)

DAYS AFTER INFECTION	CALF NUMBERS			
	255	278	279	MEAN
0	1.2	1.4	1.2	1.27
1	1.2	1.4	1.2	1.27
2	1.2	1.4	1.2	1.27
3	1.2	1.4	1.2	1.27
4	1.2	1.4	1.2	1.27
5	1.2	1.4	1.2	1.27
6	1.2	1.4	1.2	1.27
7	1.2	1.4	1.2	1.27
8	1.2	1.4	1.2	1.27
9	1.2	1.4	1.2	1.27
10	1.4	1.4	1.2	1.33
11	1.6	1.4	1.2	1.40
12	2.0	1.8	1.2	1.67
13	2.0	2.0	1.2	1.73
14	2.2	2.0	1.4	1.87
15	2.2	2.0	1.4	1.87
16	1.8	2.0	1.8	1.87
17	1.6	1.9	1.8	1.77
18	1.6	1.8	1.8	1.73
19	2.2	1.8	2.0	2.00

TABLE 28 CONTINUED

DAYS AFTER INFECTION	CALF NUMBERS 255	278	279	MEAN
20	1.8	1.9	1.8	1.83
21	1.8	2.0	1.6	1.80
22	1.6	1.8	1.6	1.67
23	1.8	1.8	1.6	1.73
24	1.4	1.6	1.4	1.47
25	1.2	1.4	1.6	1.40
26	1.2	1.2	1.4	1.27
27	1.2	1.2	1.4	1.27
28	1.2	1.2	1.4	1.27

PI - Pink

PA - Pale

PE - Petechiae

R.R. - Respiratory rate

R.S. - Respiratory sounds

0 - Normal

1 - Slightly harsh

2 - Harsh

3 - Very harsh (Dyspnea)

N.D. - Nasal Discharge

\+ - Serous

++ - Mucoid

+++ - Mucopurulent

++++ - Purulent

APP. - Appetite

G - Good

DE - Depressed

A - Anorexia

F - Fair

G - Good

P - Poor

DEM. - Demeanor

B - Bright

D - Dull

COAT:-

R - Stary

SM - Smooth

O.D. - Ocular Discharge

\+ - Serous

++ - Mucoid

+++ - Mucopurulent

++++ - Purulent

RUMEN:-

S - Strong

W - Weak

TABLE 29

CALF 254 CLINICAL SIGNS - THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO

DAY	TEMP. °F	RPG Cm	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D
0	100.4	1.4	52	PI	16	0	-	-	G	-	S	-	G	B	SM	-
1	100	1.4	48	PI	16	0	-	-	G	-	S	-	G	B	SM	-
2	100	1.4	64	PI	16	0	-	-	G	-	S	-	G	B	SM	-
3	100	1.4	56	PI	12	0	-	-	G	-	S	-	G	B	SM	-
4	99.9	1.4	52	PI	12	0	-	-	G	-	S	-	G	B	SM	-
5	101.2	1.4	64	PI	16	0	-	-	G	-	S	-	G	B	SM	-
6	101	1.4	48	PI	12	0	-	-	G	-	S	-	G	B	SM	-
7	100.4	1.4	52	PI	20	0	-	-	G	-	S	-	G	B	SM	-
8	100.4	1.4	52	PI	16	0	-	-	G	-	S	-	G	B	SM	-
9	102.2	1.4	48	PI	12	0	-	++	G	-	S	-	G	B	SM	-
10	102.6	1.6	52	PI	12	0	-	-	G	-	S	-	G	B	SM	-
11	103.4	1.8	56	PI	16	0	-	-	G	-	S	-	G	B	SM	-

TABLE 29 CONTINUED

DAY	TEMP. °F	RPG Cm	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
12	104.7	1.8	52	PI	16	0	-	++	G	-	S	-	G	D	SM	-
13	104.4	1.8	68	PI	16	0	+ (dry)	-	G	-	S	-	G	D	R	++
14	105.6	1.8	60	PI	20	0	+	++	G	-	W	-	G	D	R	-
15	104.7	2.0	60	PI	20	1	+	-	G	-	W	-	G	D	R	-
16	105.4	2.0	60	PI	28	2	(moist)	++	DE	-	W	-	G	D	R	+
17	105.1	2.0	62	PI	28	3	+	-	DE	-	W	-	G	D	R	-
18	104.5	2.2	72	PI	20	3	+	-	DE	-	W	+	G	D	R	+
19	104.7	2.0	60	PE	28	3	+	+++	DE	-	W	+	G	D	R	+
20	106.0	2.0	80	PE	36	3	+	++	DE	-	W	+	P	D	R	-
21	105.3	2.1	92	PE	36	3	+	+++	DE	-	W	+	P	D	R	-
22	104.4	2.0	90	PE	40	3	+	+++	DE	-	W	+	P	D	R	+

TABLE 30

CALF 257 CLINICAL SIGNS - THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO

DAY	TEMP. °F	RPG Cm	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	101.1	1.2	52	PI	20	0	-	-	G	-	S	-	G	B	SM	-
1	101.5	1.2	68	PI	16	0	-	-	G	-	S	-	G	B	SM	-
2	101.7	1.2	72	PI	20	0	-	-	G	-	S	-	G	B	SM	-
3	101.8	1.2	52	PI	20	0	-	-	G	-	S	-	G	B	SM	-
4	101.8	1.2	52	PI	20	0	-	-	G	-	S	-	G	B	SM	-
5	101.6	1.2	64	PI	16	0	-	-	G	-	S	-	G	B	SM	-
6	100	1.4	56	PI	16	0	-	-	G	-	S	-	G	B	SM	-
7	103.2	1.4	60	PI	16	0	-	-	G	-	S	-	G	B	SM	-
8	103.6	1.8	60	PI	20	0	-	-	G	-	S	-	G	B	SM	-
9	102.4	1.8	56	PI	20	0	-	-	G	-	S	-	G	B	SM	-
10	100.6	2.0	60	PI	20	0	-	-	G	-	S	-	G	B	SM	-
11	101.2	2.0	60	PI	16	0	-	-	G	-	S	-	G	B	SM	-

TABLE 30 CONTINUED

DAY	TEMP. °F	RPG Cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
12	103.1	1.8	76	PI	24	1	+	+++	G	-	S	-	G	D	R	-
13	104.9	2.0	80	PI	20	1	+ (dry)	++	G	-	S	-	G	D	R	-
14	104.2	2.0	80	PI	20	1	+	+++	G	-	S	-	G	D	R	-
15	104.5	1.8	84	PI	36	1	+	-	G	-	S	-	G	D	R	-
16	104.9	1.8	82	PI	20	1	+	-	DE	-	S	-	P	D	R	-
17	106.5	1.8	60	PI	30	1	+	-	DE	-	S	-	P	D	R	-
18	107.2	1.8	76	PI	20	1	moist	++	DE	-	S	-	P	D	R	-
19	104.5	1.6	76	PI	20	1	+	+++	DE	-	W	-	P	D	R	-
20	106.2	1.6	80	PI	20	3	+	-	DE	-	W	-	P	D	R	-
21	106.0	1.6	72	PE	20	3	+	+++	DE	-	W	-	P	D	R	-

TABLE 31

MEANS AND STANDARD DEVIATIONS (SD) IN 3 CALVES (255, 278 AND 279) WHICH RECOVERED FROM THEILERIA PARVA (MUGUGA) STABILATE 44 (DILUTED) INFECTION

PARAMETER		SGOT S.F. UNITS	LDH (W.U.)	A.P. SIG. UNITS	TP Gm %	A/G RATIO	TB mg %	WBC /Cmm x 10^3	PCV	HB Gm %	RBC /Cmm x 10^6
PRE-INFECTION	N	17	18	18	18	15	15	15	15	15	15
LEVELS	MEAN	84.03	617.56	3.75	6.72	0.69	0.16	10.35	35.47	11.9	7.87
	SD	15.42	83.23	1.17	0.35	0.17	0.04	2.10	4.39	1.27	0.86
TEMPERATURE REACTION PERIOD	N	9	9	9	9	9	9	9	9	9	9
	MEAN	136.67	586.22	1.86	6.31	0.78	0.36	5.63	28.33	8.83	7.19
POST-TEMPERATURE REACTION LEVELS	N	23	23	23	23	23	15	23	23	23	23
	MEAN	117.13	576.70	1.29	6.03	1.03	0.31	9.02	23.40	6.79	5.29
	SD	40.18	105.50	0.50	0.49	0.66	0.16	2.43	4.60	1.90	1.61

TABLE 32

MEANS AND STANDARD DEVIATIONS IN SOME PARAMETERS MEASURED IN 2 CALVES (254, 257) WHICH DIED FROM THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO

PARAMETER		SGOT S.F. UNITS	LDH W.U.	A.P. SIG. UNITS	TP Gm %	A/G RATIO	TB mg %	WBC /Cmm x 10^3	PCV	HB Gm %	RBC /Cmm x 10^6
PRE-INFECTION LEVELS	N	12	12	12	12	12	10	10	10	10	10
	MEAN	77.33	527.3	2.37	6.74	0.87	0.16	12.47	40.4	13.2	8.60
	SD	10.73	59.68	0.40	0.39	0.22	0.06	1.26	2.11	0.73	0.64
POST-TEMPERATURE RISE LEVELS	N	13	13	13	13	13	11	13	13	13	13
	MEAN	388.85	919.4	1.17	5.82	0.85	1.16	4.24	28.2	9.11	7.26
	SD	288.56	489.4	1.12	0.37	0.18	1.19	3.23	2.41	0.98	1.18

TABLE 33

SUMMARY OF MEANS OF SOME BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS MEASURED IN 3 CALVES WHICH RECOVERED FROM THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO (CALVES - 255, 278, 279)

DAYS AFTER INFECTION	WBC /Cmm x 10^3	LYMP. /Cmm x 10^3	NEUTR. /Cmm x 10^3	SGOT S.F.	LDH W.U.	TB mg %	DB mg %
0	10.3	7.97	2.16	86.6	617.5	0.16	0.05
1	12.0	8.00	3.75	98.3	653.0	0.18	0.05
2	10.0	7.56	2.75	94.7	648.0	0.18	0.05
3	10.0	7.10	2.79	85.8	658.7	0.27	-
5	9.3	7.13	2.13	111.3	534.7	0.13	0.06
7	10.5	7.62	2.91	102.5	441.3	0.20	0.08
9	8.4	6.11	2.28	100.0	446.7	0.21	0.03
10	10.6	8.53	2.86	95.7	409.3	0.18	0.16
12	7.8	5.06	2.68	95.7	502.7	0.17	0.14
14	6.3	4.37	1.90	111.0	569.3	0.35	0.14
16	5.6	4.00	1.44	153.3	581.3	0.40	-
17	4.80	3.98	0.68	133.3	576.0	0.30	0.17
19	8.05	5.24	0.97	166.0	661.3	0.28	0.15
21	8.33	5.35	1.52	160.7	658.7	0.33	0.17
23	8.40	5.98	2.37	103.3	398.7	0.29	-
26	12.5	9.09	3.18	72.7	633.3	0.25	-
28	9.5	7.40	1.82	93.3	602.7	0.27	-
30	11.0	7.99	2.79	126.7	565.3	-	-
35	-	6.36	1.98	120.0	612.0	-	-

TABLE 34

SUMMARY OF MEANS OF SOME BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS MEASURED IN 2 CALVES (254 AND 257) WHICH DIED OF THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO

DAYS AFTER INFECTION	WBC /Cmm x 10^3	LYMP. /Cmm x 10^3	NEUTR. /Cmm x 10^3	SGOT S.F.	LDH W.U.	TB mg %	DB mg %
0	12.46	8.87	3.43	77.4	527.3	0.22	0.05
1	13.0	7.93	4.70	84.0	518.0	0.11	0.05
2	12.30	8.68	3.51	76.0	544.0	0.19	0.09
3	11.95	8.79	2.99	78.0	522.0	0.28	0.10
5	12.78	10.44	2.27	104	438	0.12	0.09
7	11.45	9.28	2.17	96.3	426	0.24	0.10
9	9.05	7.00	1.97	96.0	298	0.29	0.05
10	8.75	7.87	0.88	80.0	404	0.26	0.19
12	6.60	5.59	1.02	96.5	362	0.23	0.14
14	8.35	6.19	1.90	101.0	462	0.43	0.14
16	5.25	4.20	1.05	404	740	0.40	-
17	3.05	2.41	0.65	423	908	1.30	0.35
19	1.65	1.30	0.35	567	1444	1.12	0.39
21	1.29	1.15	0.15	635	1652	3.11	0.43
23	2.7	2.19	0.26	600	816	-	-

TABLE 35

MACROSCHIZONT INDEX (MSI) IN 5 CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 I:IO DILUTION

DAYS AFTER INFECTION	CALF NUMBERS				
	254	255	257	278	279
11	+	+	-	-	-
13	5	-	+	+	+
14	22	19	9	4	4.8
15	19	14	12	7	7
16	58	1	19	34	12
17	42	0.25	16	35	6
18	70	1	12	3	6.25
19	56	1	36	0.75	1.00
20	88	9	48	-	NONE
21	75	-	52	2	-
22	71	0.25	D	0.25	-
23	D	2.5	-	NONE	-
26	-	NONE			

TABLE 36

PIROPLASM PERCENTAGES IN 5 CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 (I:IO DILUTION)

DAYS AFTER INFECTION	CALF NUMBERS				
	254	255	257	278	279
14	+	+	-	-	-
15	0.5	0.75	0.5	0.5	0.75
16	0.5	0.75	0.5	0.25	1.00
17	1.5	0.25	0.75	1.00	0.75
18	4.0	0.25	1.50	0.50	9.0
19	12	1.5	2.5	1.00	8.00
20	17	0.5	5.5	0.25	-
21	19	0.5	12.5	NONE	7.00
22	15	-	D	-	12.00
23	D	0.25	-	-	8
26	-	NONE	-	-	4
28	-	-	-	-	0.5
30	-	-	-	-	NONE

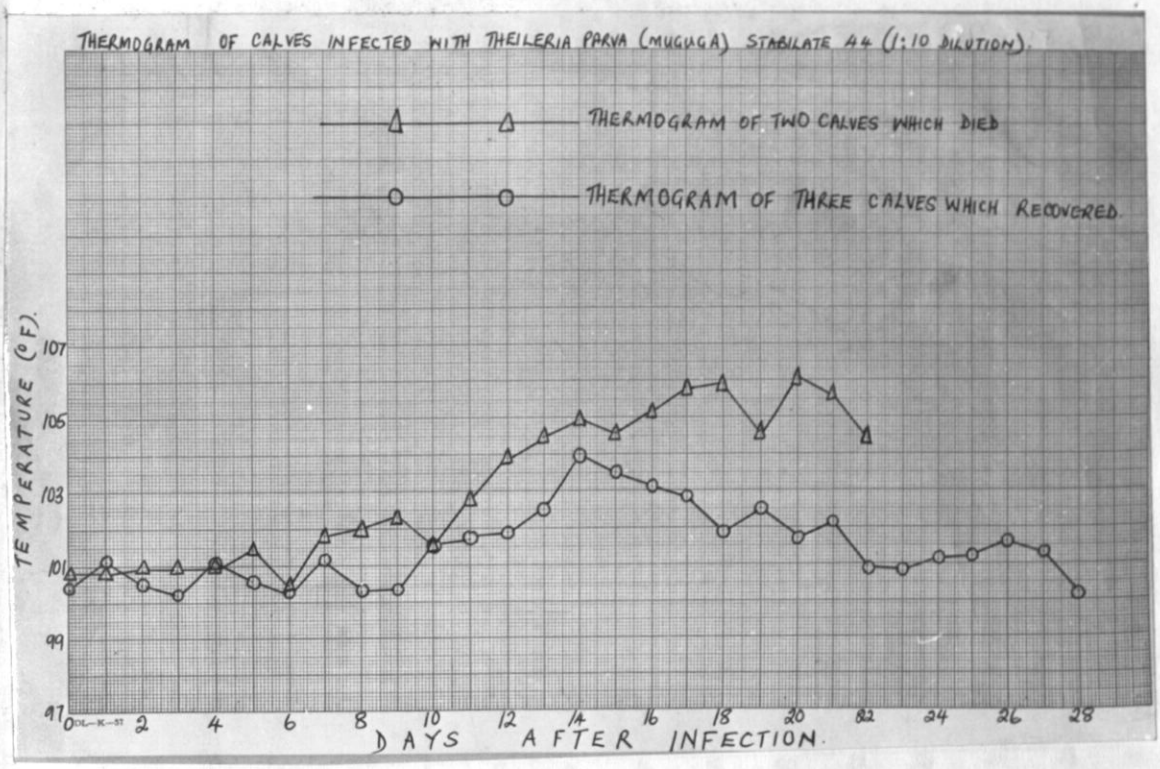


Fig. 17. Thermogram of calves infected with Theileria parva (Muguga) stabilate 44 diluted I:IO.

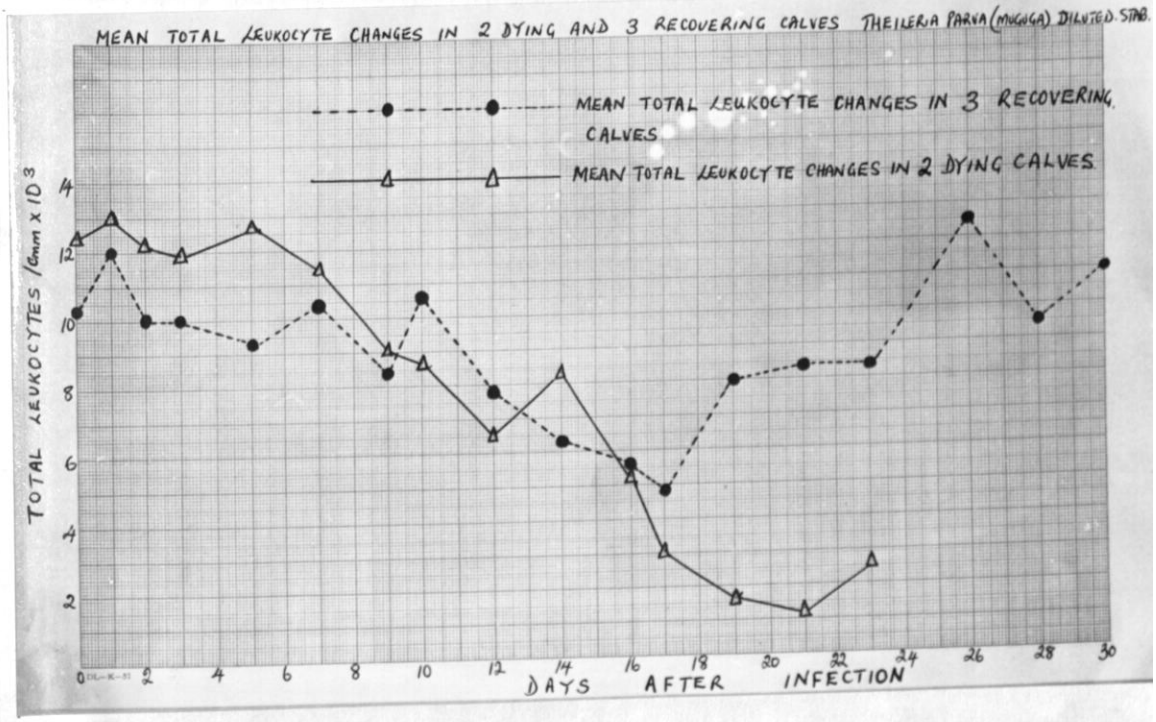


Fig. 18. Mean total leukocyte changes in two dying and 3 recovering calves - Theileria parva (Muguga) diluted stabilate 44

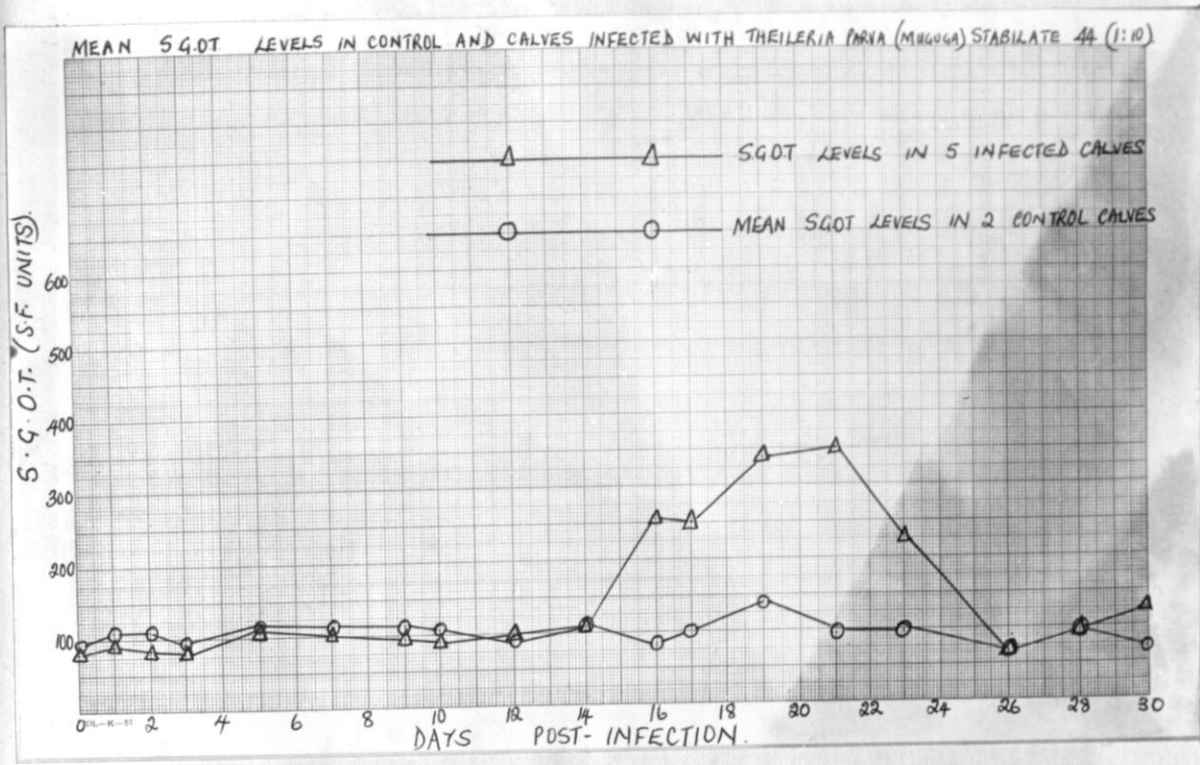


Fig. 19. Mean SGOT changes in two controls and five calves infected with Theileria parva (Muguga) diluted stabilate 44.

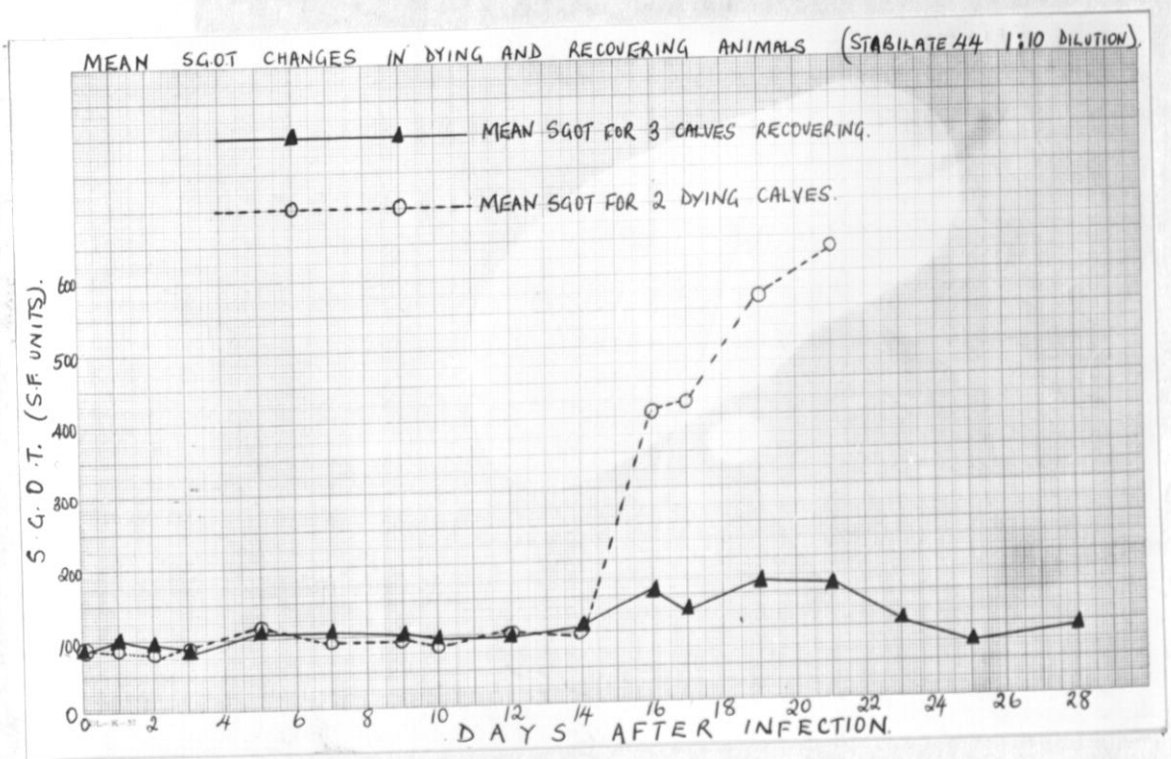


Fig. 20.
Comparing SGOT changes in two dying and three recovering calves - Theileria parva (Muguga) stabilate 44 diluted.

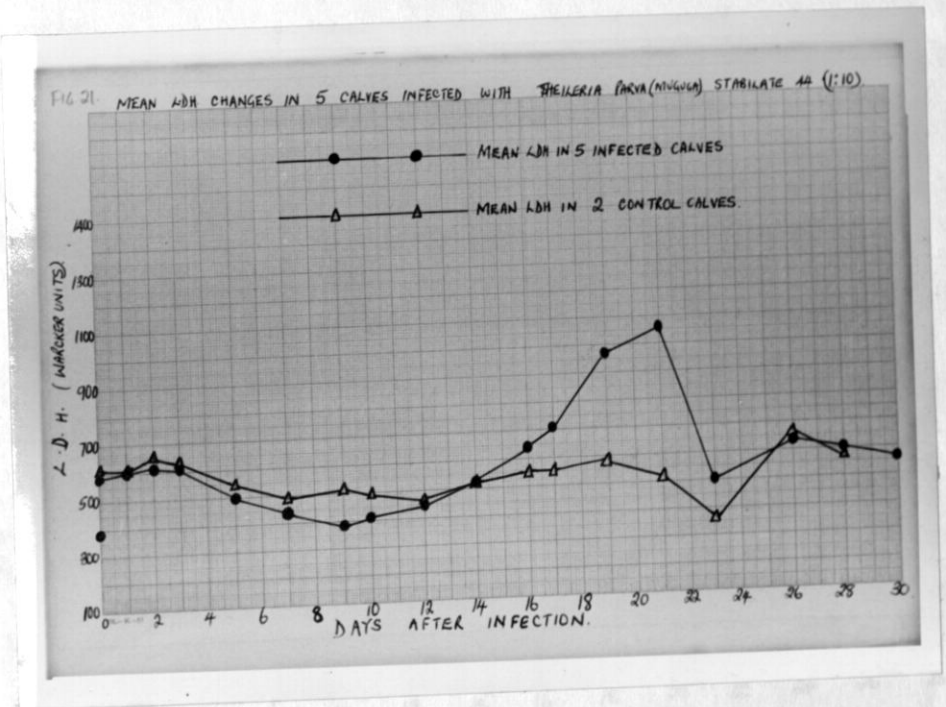


Fig. 21. Mean L.D.H. changes in five infected and two control calves diluted stabilate 44 - infection.

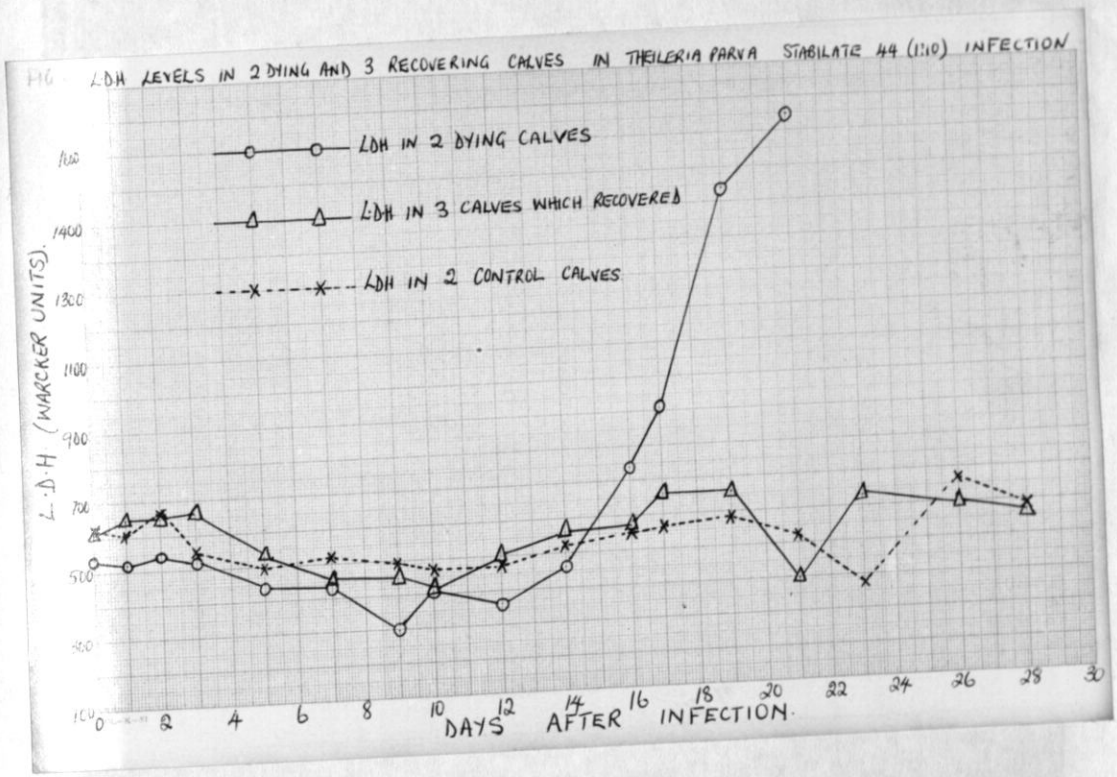


Fig. 22. Comparing LDH levels in two dying, three recovering and two control calves. Diluted stabilate 44 - Theileria parva (Muguga) infection.

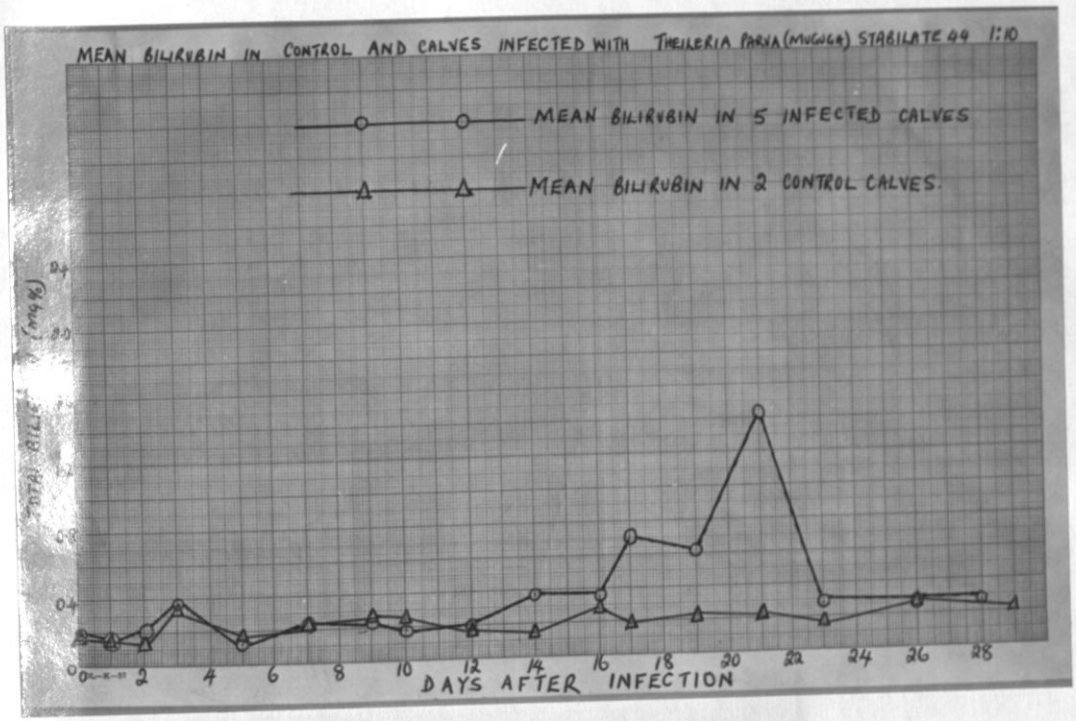


Fig. 23.
Mean total bilirubin in control and calves infected with Theileria parva (Muguga) stabilate 44 diluted I:IO.

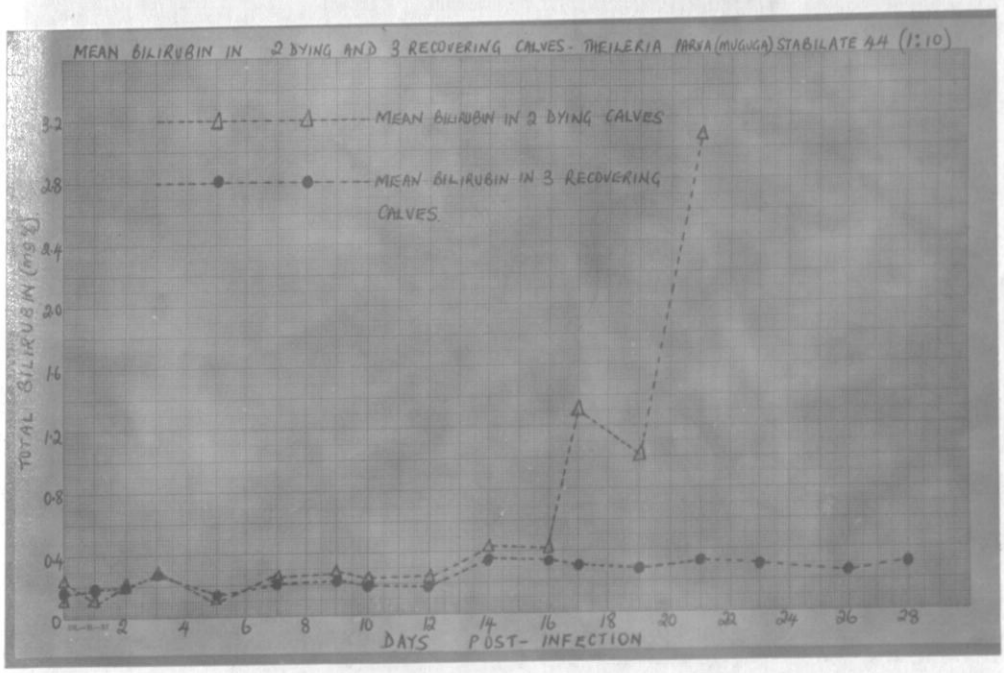


Fig. 24. Comparing mean total bilirubin in two dying and three recovering calves - Theileria parva (Muguga) stabilate 44 diluted I:IO.

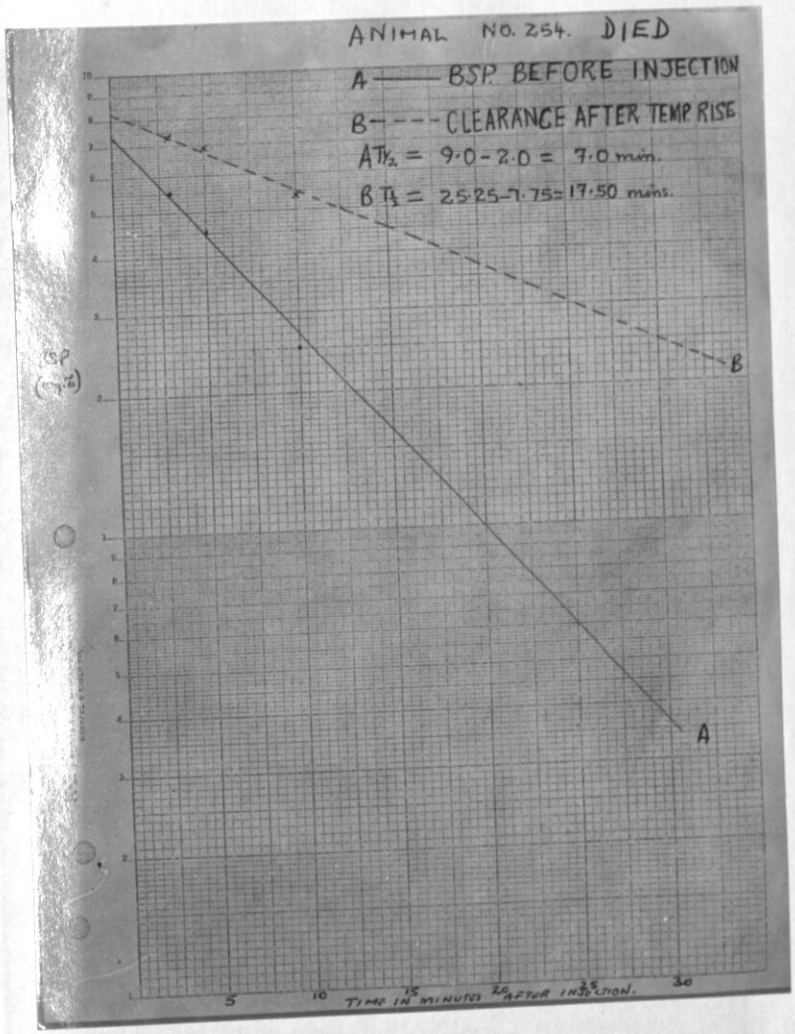


Fig. 25. B.S.P. Clearance in calf 254. Clearance time increased by 10.5 minutes.

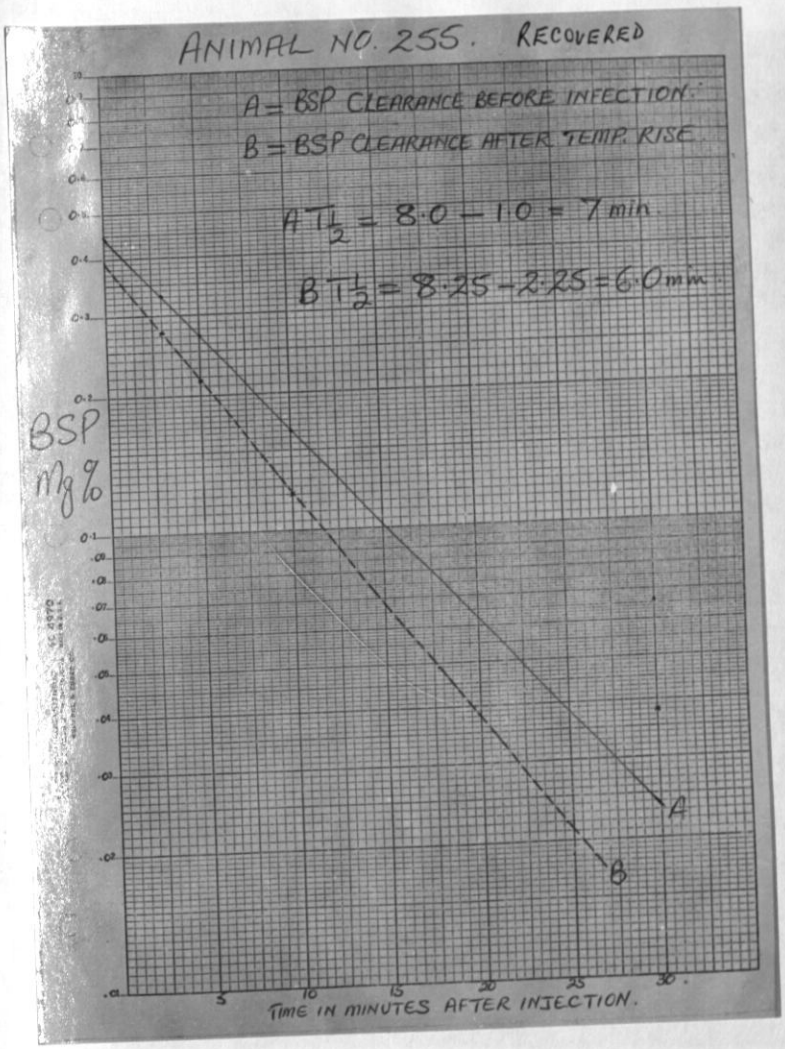


Fig. 26. B.S.P. clearance for calf 255 which recovered.

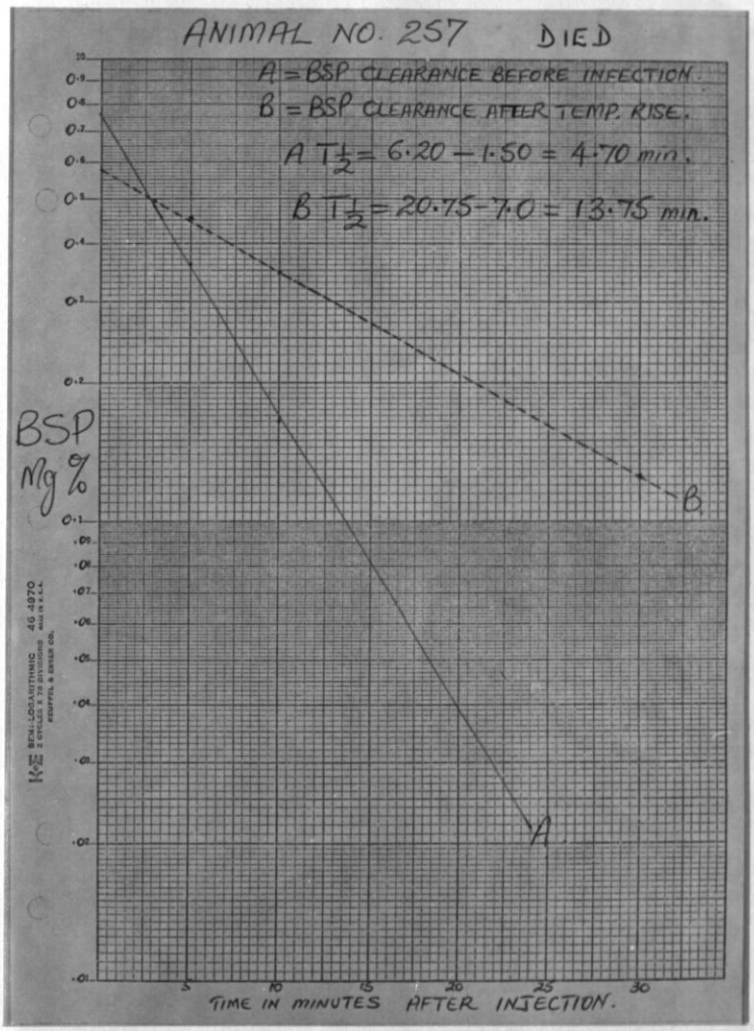


Fig. 27. B.S.P. clearance for calf 257. Clearance time increased by 9.05 minutes.

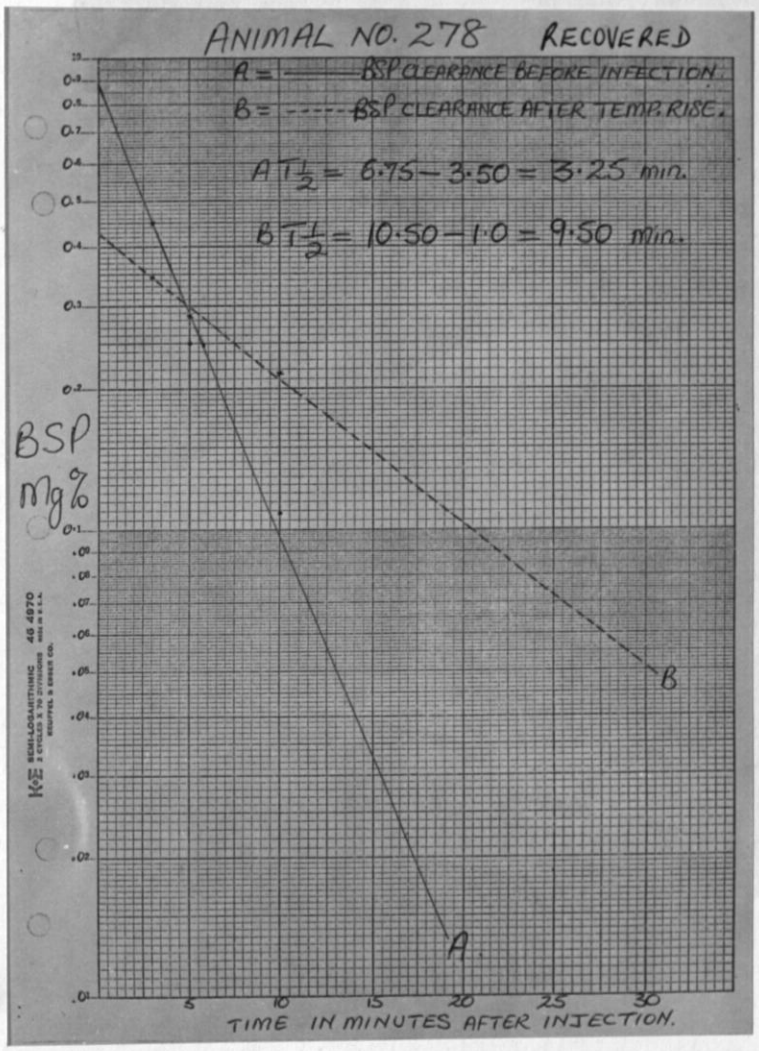


Fig. 28. B.S.P. clearance for calf 278 which recovered. There was increased clearance time of 6.25 minutes.

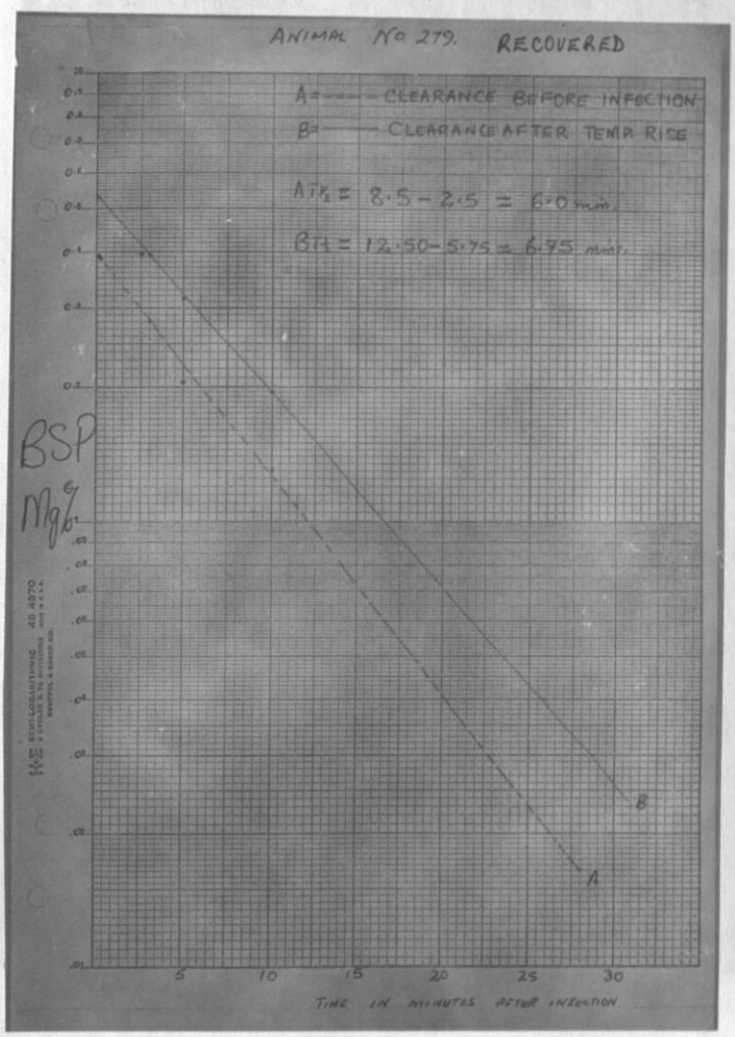


Fig. 29. B.S.P. clearance for calf 279 which recovered.

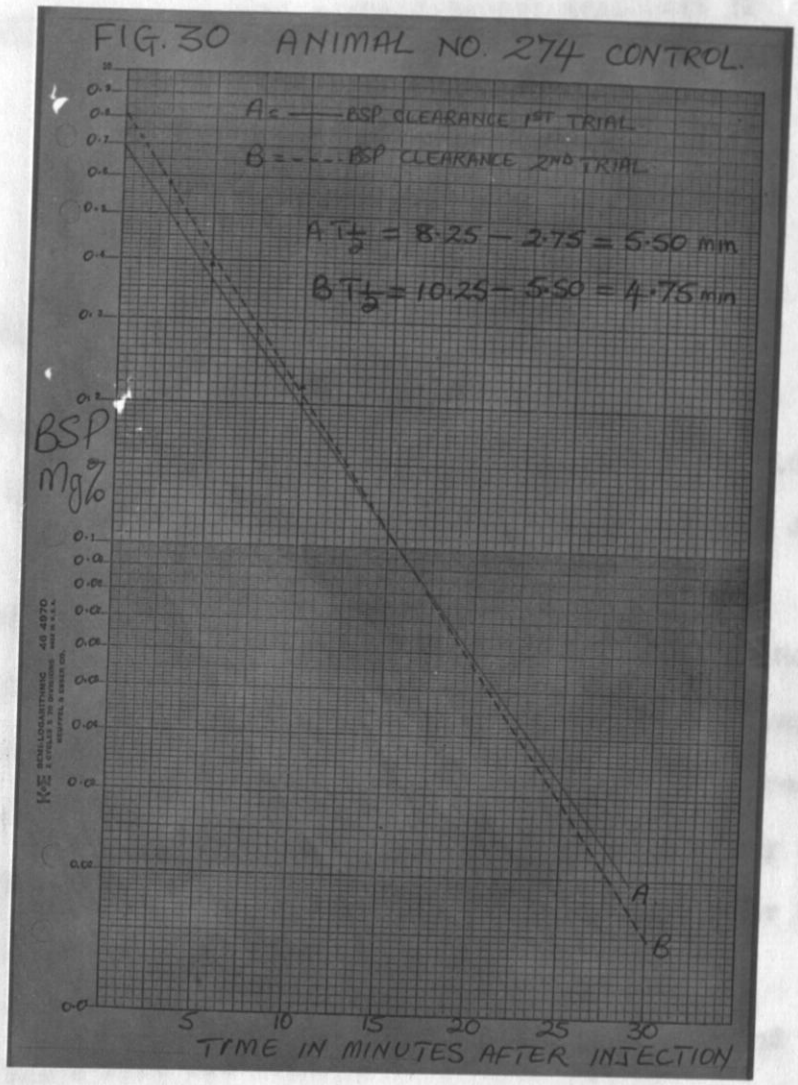


Fig. 30. B.S.P. clearance for calf 274 which was used as control.

EXPERIMENT 3: THEILERIA PARVA (KIAMBU) STABILATE 32 INFECTION

R E S U L T S :

Clinical Signs:

The results are summarised on table 37. One out of five calves died from infection. This gives a mortality rate of 20%. Incubation period was on the average 12 days. Calf 280 never attained a temperature above 103°F (Appendix 5). This calf ran an inapparent disease. Macroschizonts which were detected in the right parotid lymph node were the only sign of infection. Two other calves (L25 and W25) suffered a mild disease from which they recovered. Calf L22 reacted severely but recovered after a febrile period of 18 days (table 37).

There were few signs in the two calves (L25 and W25) which reacted mildly. A swelling of the REG occurred followed by temperature reaction, with temperature above 103°F being considered significant. Febrile period was 7 days (calf L25) and 8 days (calf W25). Remission of fever occurred in both calves (figures 32 and 33). Remission was recorded when the temperature fell below 103°F during the febrile period. This was 2 and 4 days in calves L25 and W25 respectively. During the temperature reaction, the two calves became dull with stary coats. There was an occasional dry cough in both calves during the reaction

but it disappeared when the calves recovered.

Calf L22 suffered a sub-acute disease. Fever persisted for 18 days (table 37). This calf also became dull. The coat became stary. The peripheral lymph nodes were enlarged but regressed later (table 38). Appetite became depressed and the calf was noticed shivering. A mucopurulent nasal discharge was present. The animal developed harsh respiratory sounds and a dry cough which later became moist and persisted even after the temperature returned to normal. Petechiation and pallor of the visible mucous membranes were seen over the febrile period. Pulse rate increased for a short period beyond the temperature reaction period. The eyes were sunken and skin less elastic indicating dehydration. A noticeable loss of condition occurred in this animal. Progressive muscle wasting was followed by weakness, inco-ordination and eventual recumbency. Diarrhea was observed for three days over the febrile period. When the temperature dropped back to normal, the calf became bright and gained a good appetite but continued being recumbent. After recovering from the East Coast Fever, this calf died after eighty two days. Post-mortem revealed a bacterial pneumonia and peritonitis. It also had abscesses on the rumen and the liver. Corynebacteria was isolated from the abscesses.

Calf number W27 ran an acute disease and died after reacting for 9 days (table 37). After temperature rise,

the calf became dull and the coat was stary. The right prescapular gland which was measured daily became enlarged until death.

There was increased nasal and lacrimal discharges which were mucoid and later mucopurulent. Corneal opacity developed on the left eye just before the calf died. The respiratory rate increased and respiration sounds were harsh, dyspneoa being marked on the day the calf died. A dry cough became moist 5 days before death.

Pulse rate increased and mucous membranes had petechiation four days prior to death.

Rumen contraction became weak four days after the start of fever, ceasing on the day before death. Terminal dysentery was seen in this calf.

This animal was observed to be shivering and grinding its teeth starting five days before death. Recumbency occurred on the last day.

Post-mortem revealed typical East Coast Fever lesions. Contact smears of lymph node, spleen, lungs and liver which were stained with Giemsa's stain contained macroschizonts in the lymphocytes. Blood smears also stained with Giemsa's stain had piroplasms. Clinical signs for calf W27 are recorded on table 39.

Haematology:

The mean prepatent period for the appearance of macroschizonts in the local lymph node was 7.6 days (table 37).

This was on the average about 5 days before temperature rose above 103°F. Macroschizonts were noticed in smears from LPG (Left prescapular gland) at the same time the temperature went up. Calf 280 whose temperature remained below 103°F, did not have macroschizonts in LPG.

All calves, except calf 280, had a drop in total leukocyte count. This drop in leukocytes was limited to the febrile period in the calves (L22, L25, W25) which recovered but was progressive until death in calf W27. Figure 34 compares the mean leukocyte levels in all calves that recovered and calf W27. There was a general increase in total leukocyte count on Day 3. Calf L22 which started with a high leukocyte count of 16000 cells/Cmm. had a drop in the count to a low figure of 3200 WBC/Cmm. This calf on subsequent post-mortem had abscesses on the liver and the rumen. This presumably explains the persistent leukocytosis which was present even before the calf became sick. The decrease in leukocytes involved all cell type (tables 43and 44 and fig. 35).

A significant degree of anemia developed only in calf L22. The anemia was noted clinically as pallor of the mucous membranes. Haematology of this animal demonstrated a reduction in PCV, haemoglobin and erythrocyte count. Anemia was corrected when the temperature became normal (Appendix 4B). The other two surviving calves (L25 and W25) showed a slight decrease in PCV over the reaction period (Appendix 4B).

None of the calves attained a high macroschizont index (table 40). Calf 280 did not have any macroschizonts in the left prescapular gland smears. Among the other recovering calves, L22 attained highest MSI. The calf reacted severely. Parasites were not seen in lymph smears after the febrile period.

Piroplasmas were observed in the blood smears on the second day after macroschizonts were observed in the LPG smears. Piroplasm parasitaemia increased steadily in the dying calf but remained very low in the recovering calves (table 41). Piroplasms persisted in blood smears upto 10 days in one surviving calf (L25) after temperature dropped to normal.

No change was recorded in the circulating thrombocyte count (Appendix 4B).

Biochemistry:

Figure 36 contains mean SGOT changes in four calves which recovered. Changes in calf W27 were also included in the above figure for comparison. There was a slight increase in SGOT levels of the recovering calves over the reaction period (table 44 and fig. 36). The increase was mainly due to high levels of SGOT attained by calf L22 (Appendix 4A). The mean levels dropped to normal after the febrile period in the recovering calves. Levels of SGOT increased progressively until W27 died (table 43 and fig. 36).

Lactate dehydrogenase (LDH) levels did not change in the four calves which recovered (fig. 37 and 38). High LDH values were recorded just before death in calf W27 (fig. 38).

There was no change in alkaline phosphatase (Appendix 4A). No significant alteration was recorded in the recovering calves (fig. 39). Calf L22, however had slight elevation of total bilirubin over the fever reaction period (Appendix 4A). There was a significant increase in total bilirubin in W27. This increase was mostly terminal and was mainly due to indirect bilirubin (table 42).

A slight decrease of total serum proteins was observed and was most marked in calf W27. The decrease was mainly due to reduction in serum albumin (Appendix 4A).

Blood Urea Nitrogen (BUN) increased terminally in W27 (table 43).

Increased B.S.P. clearance time was only seen with calf W27(figures 40, 41, 42, 43, 44 and 45).

TABLE 37

SUMMARY OF RESULTS IN 5 CALVES INFECTED WITH THEILERIA PARVA (KIAMBU) STABILATE 32

ANIMAL NO.	I.F.A. TEST	DAYS TO MACROS. (REG)	DAYS TO TEMP. ABOVE 103°F	DAYS TO MACROS. (LPG)	FEBRILE PERIOD	RESULT
L22	I:IO	8	10	12	18	RECOVERED
L25	I:IO	7	14	14	7	RECOVERED
W25	I:IO	9	12	14	8	RECOVERED
W27	I:IO	7	13	13	9	DEAD
280	I:IO	7	B	NONE	-	NON-PATENT
MEAN		7.6	12.3	13	10.5	

B - Temperature below 103°F through out
I.F.A - Indirect Fluorescent antibody
REG - Right ear gland
LPG - Left prescapular gland
MACROS - Macroschizont

KEY TO TABLE 38.

RPG - Right prescapular lymph node

M.M. - Mucous membranes

- PI - Pink
- PA - Pale
- PE - Petechiae

R.R. - Respiratory rate

R.S. - Respiratory sounds

- 0 - Normal
- 1 - Slightly harsh
- 2 - Harsh
- 3 - Very harsh (Dyspnea)

N.D. - Nasal Discharge

- \+ - Serous
- ++ - Mucoid
- +++ - Mucopurulent
- ++++ - Purulent

APP. - Appetite

- G - Good
- DE - Depressed
- A - Anorexia

DEHYD. - Dehydration

CONDITION:-

- F - Fair
- G - Good
- P - Poor

DEM. - Demeanor

- B - Bright
- D - Dull

COAT:-

- R - Stary
- SM - Smooth

O.D. - Ocular Discharges

- \+ - Serous
- ++ - Mucoid
- +++ - Mucopurulent
- ++++ - Purulent

RUMEN:-

- S - Strong
- W - Weak

TABLE 38

CLINICAL SIGNS CALF L22 - T. PARVA (KIAMBU)

DAY	TEMP. °F	RPG Cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	101.2	1.6	72	PI	16	0	-	-	G	-	S	-	G	B	SM	-
1	101.2	1.6	80	PI	24	0	+	-	G	-	S	-	G	B	SM	-
2	101.3	1.8	72	PI	16	0	-	-	G	-	S	-	G	B	SM	-
3	100.4	1.8	76	PI	20	0	-	-	G	-	S	-	G	B	SM	-
4	101.5	1.6	80	PI	20	0	-	-	G	-	S	-	G	B	SM	-
5	100.8	1.8	80	PI	24	0	-	-	G	-	S	-	G	B	SM	-
6	100.4	1.6	80	PI	20	0	-	-	G	-	S	-	G	B	SM	-
7	100	1.6	90	PI	30	0	-	-	G	-	S	-	G	B	SM	-
8	100.4	1.6	80	PI	16	0	-	-	G	-	S	-	G	B	SM	-
9	101.5	1.6	92	PI	24	0	+	-	G	-	S	-	G	B	SM	-
10	100.4	1.8	80	PI	24	0	+ (dry)	+++	G	-	S	-	G	B	SM	-
11	103.1	1.8	76	PI	20	0	-	++	G	-	S	-	G	B	SM	-
12	103.1	1.8	76	PI	20	0	-	++	G	-	S	-	G	B	SM	-
13	103.5	1.9	84	PI	20	2	-	+++	G	-	S	-	G	D	R	-
14	104.4	1.8	96	PI	32	2	+	+	DE	-	S	-	G	D	R	-
15	105.3	1.9	100	PI	40	2	+	-	DE	-	S	-	G	D	R	-
16	105.3	2.0	105	PI	28	2	+	+	DE	-	S	-	G	D	R	-

TABLE 38 CONTINUED

DAY	TEMP. °F	RPG Cm.	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
17	105.3	2.0	80	PE	24	2	moist	++	DE	-	S	-	G	D	R	-
18	106.2	2.0	90	PE	28	2	+	+++	DE	-	S	-	G	D	R	-
19	105.8	2.0	80	PE	28	2	+	+++	DE	-	S	-	G	D	R	-
20	106.2	2.0	80	PE	28	2	+	+++	DE	+	S	-	G	D	R	-
21	104.7	2.0	76	PE	28	2	+	-	DE	+	S	-	F	D	R	-
22	103.1	1.9	68	PE	28	2	+	+++	DE	+	S	-	F	D	R	-
23	1040	1.9	70	PE	28	2	+	-	DE	+	S	-	F	D	R	-
24	105.8	1.6	84	PA	30	2	+	-	DE	+	S	-	F	D	R	-
25	104	1.4	72	PA-PE	36	2	+	-	DE	-	S	-	P	D	R	-
26	105.5	1.6	76	PA-PE	28	2	+	-	DE	-	S	-	P	D	R	-
27	103.1	1.6	80	PA	20	2	+	-	DE	-	W	+	P	D	R	-
28	102.2	1.8	64	PA	24	2	+	-	G	-	S	+	P	D	R	-
29	101.3	1.6	64	PI	20	1	+	-	G	-	S	+	P	D	R	-
30	101.3	1.6	68	PI	16	0	+	-	G	-	S	+	P	D	R	-
31	100.9	1.5	70	PI	20	0	+	-	G	-	S	+	P	D	R	-
32	101.6	1.4	68	PI	24	0	+	-	G	-	S	+	P	D	R	-
33	102	1.4	80	PI	20	0	+	-	G	-	S	+	P	D	R	-
34	102.6	1.4	76	PI	16	0	+	-	G	-	S	+	P	D	R	-

TABLE 39

CLINICAL SIGNS CALF W27 - T. PARVA (KIAMBU)

DAY	TEMP. °F	RPG	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
0	101.6	1.2	56	PI	20	0	-	-	G	-	S	-	G	B	SM	-
1	100.4	1.2	76	PI	20	0	+	+	G	-	S	-	G	B	SM	-
2	100.6	1.2	72	PI	16	0	-	-	G	-	S	-	G	B	SM	-
3	101.3	1.2	68	PI	16	0	-	-	G	-	S	-	G	B	SM	-
4	100.4	1.2	64	PI	16	0	+	-	G	-	S	-	G	B	SM	-
5	101.7	1.3	70	PI	16	0	-	-	G	-	S	-	G	B	SM	-
6	100.4	1.2	70	PI	16	0	-	-	G	-	S	-	G	B	SM	-
7	101.6	1.3	64	PI	20	0	-	-	G	-	S	-	G	B	SM	-
8	99.9	1.2	76	PI	16	0	-	-	G	-	S	-	G	B	SM	-
9	101.3	1.3	56	PI	24	0	-	-	G	-	S	-	G	B	SM	-
10	101.3	1.6	80	PI	22	0	-	-	G	-	S	-	G	B	SM	-
11	101.1	1.6	76	PI	20	0	-	-	G	-	S	-	G	B	R	-
12	102.6	1.6	74	PI	24	0	-	-	G	-	S	-	G	D	R	-
13	104.2	1.7	72	PI	20	0	+ (dry)	++	G	-	S	-	G	D	R	-
14	105.3	1.7	96	PI	28	0	+	-	G	-	S	-	G	D	R	-
15	106	1.8	84	PI	24	1	+	-	DE	-	S	-	G	D	R	-

TABLE 39 CONTINUED

DAY	TEMP. °F	RPG	PULSE RATE /min	M.M.	R.R. /min	R.S.	COUGH	N.D.	APP.	DIARRHEA	RUMEN	DEHYD.	CONDITION	DEM.	COAT	O.D.
16	106.7	2.0	64	PI	36	2	+	+++	DE	-	S	-	G	D	R	-
17	106.7	2.0	104	PI	24	2	moist	++	DE	-	W	-	G	D	R	-
18	105.8	2.2	104	PE	24	2	+	+++	DE	-	W	-	G	D	R	++
19	105.8	2.0	106	PE	26	2	+	+++	DE	-	W	-	G	D	R	++
20	105.8	1.8	112	PE	24	2	+	+++	DE	-	W	-	G	D	R	+++
21	105.1	1.5	100	PE	30	3	+	+++	DE	(blood)+	W	-	G	D	R	++
22	101.7	1.5	102	PE	38	3	+	+++	A	(blood)+	W	-	G	D	R	+++
23	-	-	-	-	-	-	-	-	-	-	W	-	G	D	R	-

TABLE 40

MACROSCHIZONT INDICES (MSI%) IN 5 CALVES INFECTED WITH THEILERIA PARVA (KIAMBU) STABILATE 32

DAYS	CALF NUMBERS				
	L22	L25	W25	W27	280
12	+	-	-	-	-
13	0.6	-	-	+	-
14	1.25	0.5+	0.5+	4.5	-
15	3.0	1.0	3.0	6.0	-
16	12.0	2.5	10	32.0	-
17	17.0	5.0	4.0	36.0	-
18	16.7	1.5	2.0	25.0	-
19	4	0.5	2.5	24.0	-
20	-	0.75	0.5	24	-
21	2.3	NONE	0.5	27	-
22	0.25	-	1.75	18	-
23	2.5	-	NONE	DEAD	-
24	NONE	-	-	-	-

TABLE 41

PIROPLASM PERCENTAGE IN 5 CALVES INFECTED WITH THEILERIA PARVA (KIAMBU) STABILATE 32

DAYS	CALF NUMBERS				
	L22	L25	W25	W27	280
13	0.5	-	-	-	-
14	0.5	-	-	0.25	-
15	0.75	0.25	0.75	1.0	-
16	1.0	0.50	1.0	1.0	-
17	-	0.25	1.0	0.5	-
19	-	-	-	4.0	-
20	0.5	0.5	0.25	5.0	-
22	4	1.5	NONE	14	-
24	1.0	0.75	0.25	DEAD	-
25	0.5	0.5	NONE	-	-
28	1.0	0.25			-
31	0.5	0.25			-
33	0.25	NONE			-
35	NONE				

TABLE 42

BILIRUBIN LEVELS IN CALF W27

DAYS AFTER INFECTION	TOTAL BILIRUBIN mg%	DIRECT BILIRUBIN mg%	INDIRECT BILIRUBIN mg%
0	0.39	0.06	0.42
1	0.25	0.04	0.21
2	0.18	0.02	0.16
3	0.20	0.07	0.13
4	0.18	0.15	0.03
6	0.10	0.09	0.01
8	0.04	0.02	0.02
10	0.13	0.03	0.10
13	0.40	0.20	0.20
15	0.33	0.17	0.16
18	0.75	0.35	0.40
20	1.63	0.14	1.49
22	2.12	0.30	1.82

TABLE 43

BIOCHEMICAL AND HAEMATOLOGICAL VALUES IN CALF W27

DAYS AFTER INFECTION	WBC /Cmm x 10^3	LYMP. /Cmm x 10^3	NEUTR. /Cmm x 10^3	SGOT S.F. UNITS	L.D.H. W.U.	BUN mg %
0	8.6	5.09	3.32	134	573	15
1	9.9	6.53	3.37	121	474	18
2	9.9	5.94	3.96	96	735	20
3	13.7	6.03	7.54	108	456	13
4	12.2	5.49	6.71	98	697	10
6	11.9	6.43	5.47	89	542	10
8	11.4	6.95	4.33	100	975	15
10	11.5	5.98	5.41	80	518	<10
13	4.4	1.85	2.51	86	665	15
15	3.0	2.10	0.90	190	607	18
16	2.3	1.84	0.46	172	480	25
18	0.8	0.56	0.23	260	733	20
20	0.9	0.66	0.24	260	1012	25
22	1.3	1.14	0.16	280	936	50

TABLE 44

SUMMARY OF MEANS OF SOME BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS MEASURED IN 4 CALVES WHICH RECOVERED FROM THEILERIA PARVA (KIAMBU) INFECTION

DAYS AFTER INFECTION	WBC /Cmm_3 x 10^3	LYMP. /Cmm_3 x 10^3	NEUTR. /Cmm_3 x 10^3	SGOT S.F. UNITS	LDH W.U.	TB mg %	DB mg %
0	11.45	6.90	4.15	100.5	547.8	0.25	0.08
1	11.83	7.24	4.36	116.0	578.8	0.27	0.10
2	11.88	7.91	3.68	104.0	543.0	0.28	0.03
3	12.73	7.96	4.54	107.0	507.0	0.22	0.16
4	11.35	7.92	3.29	93.3	605.8	0.22	0.11
6	10.58	7.53	2.68	102.5	762.5	0.19	0.05
8	12.10	6.60	5.21	114.3	594.7	0.27	0.07
10	10.73	7.27	3.14	90.8	582.3	0.33	0.26
13	10.63	5.29	5.85	95.5	613.8	0.26	0.09
15	7.05	4.71	2.26	100.8	656.3	0.39	0.15
16	8.33	5.78	2.40	134.5	549.5	0.45	-
18	8.18	5.96	2.15	165.3	729.3	0.32	0.18
20	6.10	4.85	1.24	148.0	773.8	0.40	-
22	7.40	5.37	2.01	141.0	807.0	0.32	0.14
24	9.33	6.78	2.66	132.0	667.8	0.24	-
25	9.13	6.53	2.56	126.0	668.3	0.25	0.06
27	7.28	4.88	2.40	115.8	649.3	0.42	-
30	11.03	7.08	3.93	108.0	629.3	0.25	-
32	11.68	6.32	5.28	116.8	716.3	0.21	0.06
34	9.70	6.26	3.25	111.3	-	0.18	-
36	9.35	5.95	3.41	116.5	-	0.11	-
38	11.83	5.19	6.40	134.0	-	0.12	-
42	9.05	4.80	3.99	87.3	-	-	-

WBC - White Blood cells
LYMP. - Lymphocytes
NEUTR.- Neutrophils
SGOT - Serum glutamic Oxalacetic transaminase
LHD - Lactate Dehydrogenase
TB - Total Bilirubin
DB - Direct Bilirubin

TABLE 45

SUMMARY OF MEANS OF SOME BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS MEASURED IN 2 CONTROL CALVES (L23 AND 273) USED IN THEILERIA (KIAMBU) INFECTION

DAYS AFTER INFECTION	WBC /Cmm x 10^3	LYMP. /Cmm x 10^3	NEUTR. /Cmm x 10^3	SGOT S.F. UNITS	L.D.H. W.U.	TB mg %	DB mg %	AP SIG. U.
0	7.67	5.96	1.65	92.0	575.0	0.29	0.14	2.80
1	8.60	6.36	2.20	104.5	596.0	0.42	0.07	3.70
2	9.75	7.24	2.52	97.0	607.5	0.31	0.14	3.98
3	9.45	7.04	2.69	107.0	466.0	0.45	0.11	3.68
4	8.70	6.30	2.29	112.5	688.5	0.48	0.10	3.78
6	8.05	6.33	2.23	109.0	803.5	0.20	0.03	3.95
8	8.15	7.41	1.25	116.0	700.0	0.28	0.10	4.73
10	8.60	6.61	1.95	99.0	593.5	0.30	0.18	4.03
13	6.45	5.10	1.34	103.5	660.0	0.27	0.09	4.13
15	7.65	6.87	0.78	103.5	722.5	0.28	0.18	3.25
16	12.40	7.37	5.03	95.5	493.0	-	-	2.75
18	8.65	6.25	2.35	113.0	554.0	0.45	0.18	2.65
20	7.95	6.66	1.26	102.5	643.5	0.35	-	2.98

TABLE 45 CONTINUED

DAYS AFTER INFECTION	WBC /Cmm x 10^3	LYMP. /Cmm x 10^3	NEUTR. /Cmm x 10^3	SGOT S.F. UNITS	L.D.H. W.U.	TB mg %	DB mg %	AP SIG. U.
22	6.90	6.28	0.99	91.0	781.0	0.35	0.15	2.90
24	8.45	6.55	1.87	106.0	656.5	0.42	-	2.25
25	7.60	5.75	1.82	101.0	681.0	0.26	0.04	2.50
27	7.80	5.62	2.19	96.0	625.0	0.33	-	2.40
30	8.85	6.64	2.22	98.5	751.0	0.41	-	3.25
32	8.45	6.50	1.96	96.0	651.5	0.28	0.07	3.58
34	7.50	6.62	0.86	111.0	-	0.22	-	3.53
36	8.85	7.51	1.29	114.0	-	0.22	-	3.53
38	7.45	6.03	1.35	86.0	-	0.11	-	3.95
42	9.60	7.14	2.47	-	-	0.10	-	3.25

WBC - White blood cells
LYMP. - Lymphocytes
NEUTR. - Neutrophils
SGOT - Serum glutamic oxalacetic transaminase
L.D.H. - Lactate dehydrogenase
TB - Total Bilirubin
DB - Direct Bilirubin
AP - Alkaline phosphatase

TABLE 46

MEANS AND STANDARD DEVIATIONS IN SOME BIOCHEMICAL PARAMETERS IN 2 CONTROL CALVES USED IN THEILERIA PARVA (KIAMBU) INFECTION

PARAMETER	N	MEAN	SD
AP(Sig. U.)	50	3.30	±0.97
SGOT (S.F. Units)	50	102.3	±13.46
LDH (W.U.)	42	632.4	±134.3
TB (mg%)	47	0.37	±0.42

N - Number of readings
SD - Standard Deviation
SGOT - Serum glutamic oxalacetic transaminase
TB - Total bilirubin
AP - Alkaline phosphatase
LDH - Lactate dehydrogenase

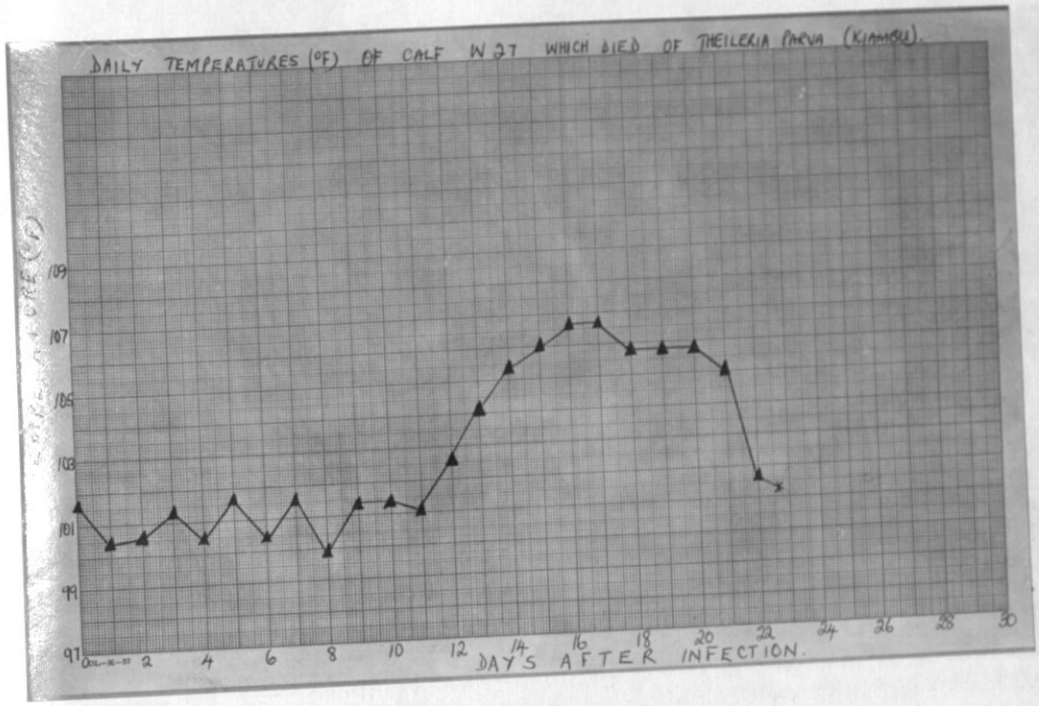


Fig. 31. Daily temperature reaction in calf W27.

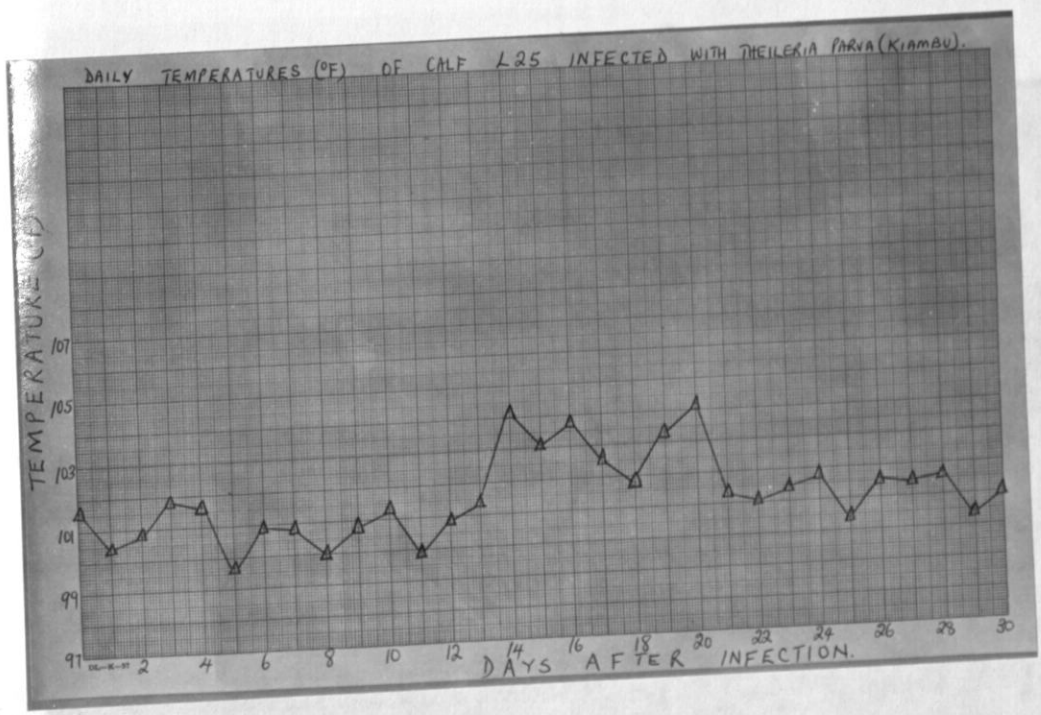


Fig. 32.
Daily temperature in calf L25.

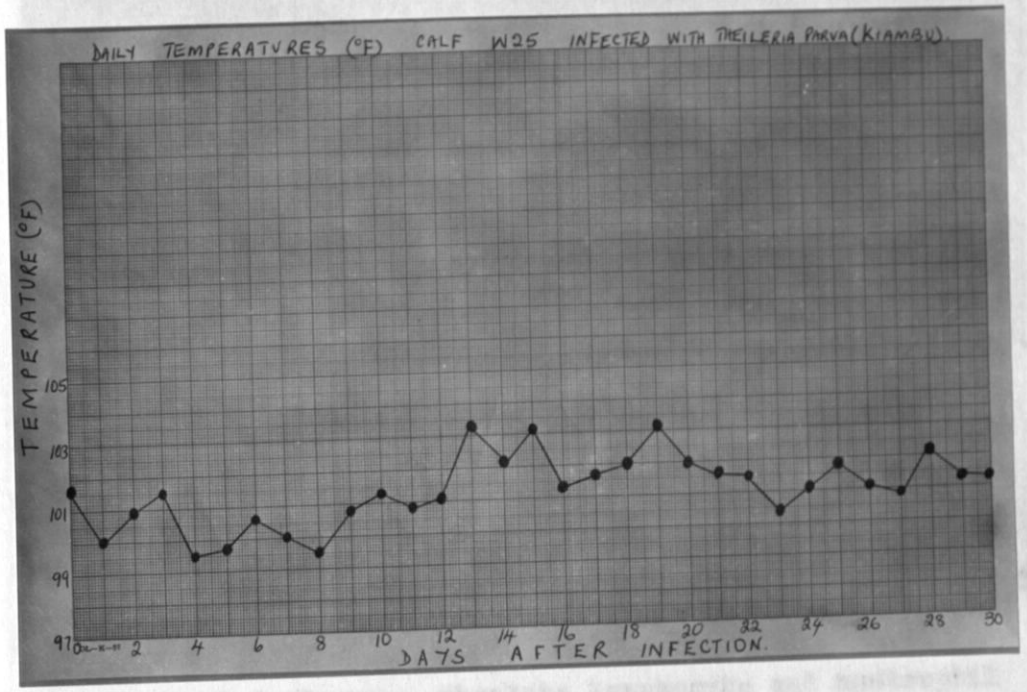


Fig. 33. Daily Temperatures in calf W25.

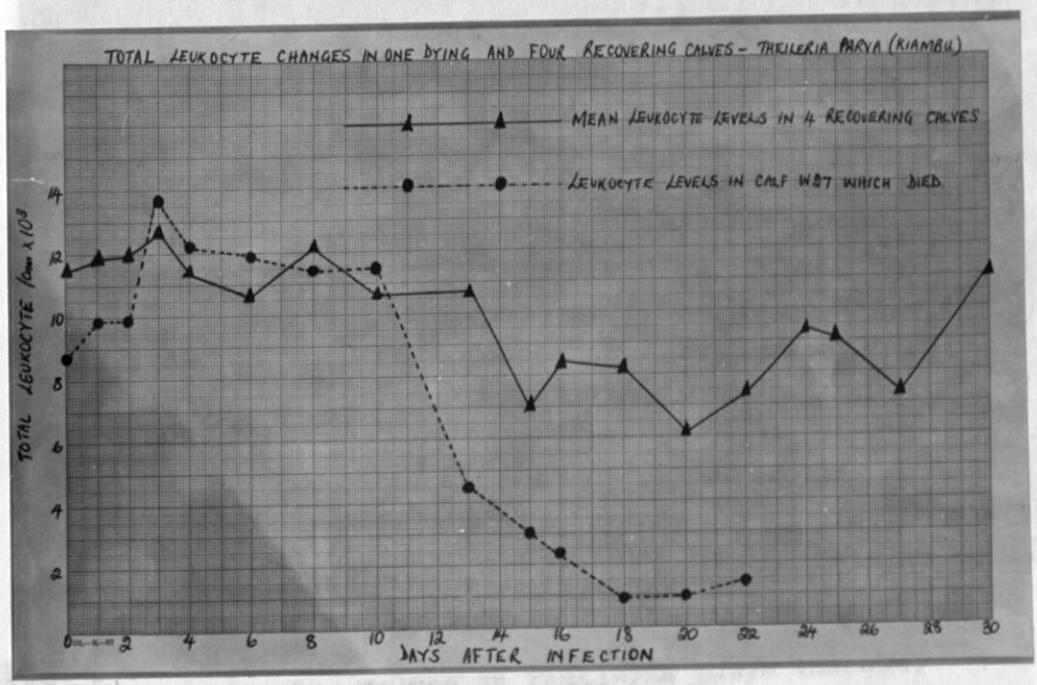


Fig. 34. Total leukocytes changes in one dying and four recovering calves - Theileria parva (Kiambu) infection.

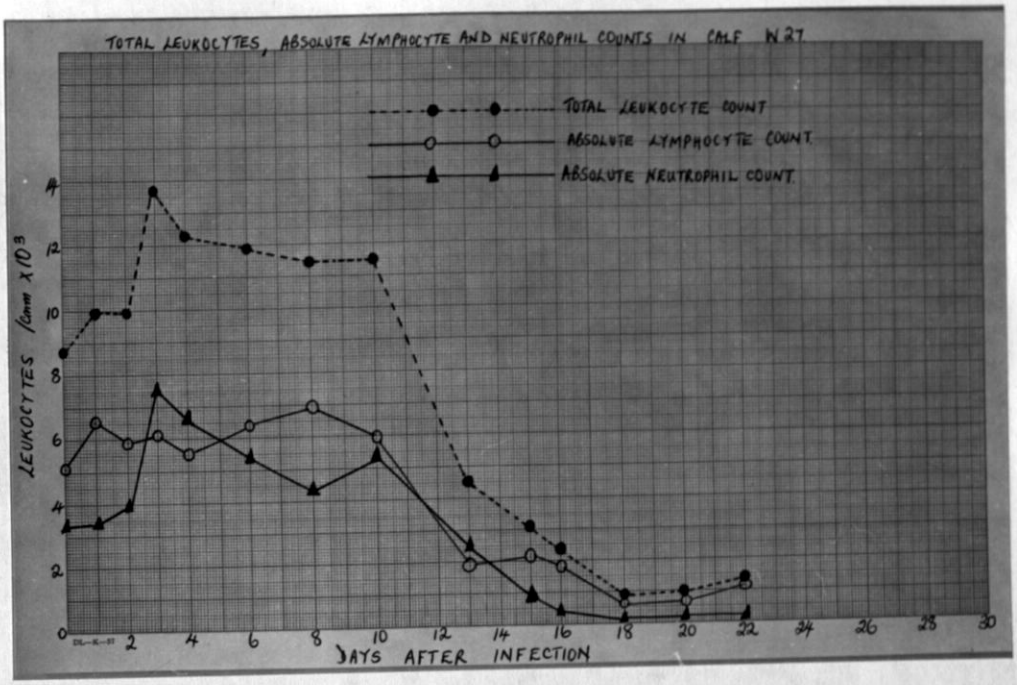


Fig. 35. Total leukocyte, absolute lymphocyte and neutrophil counts in calf W27.

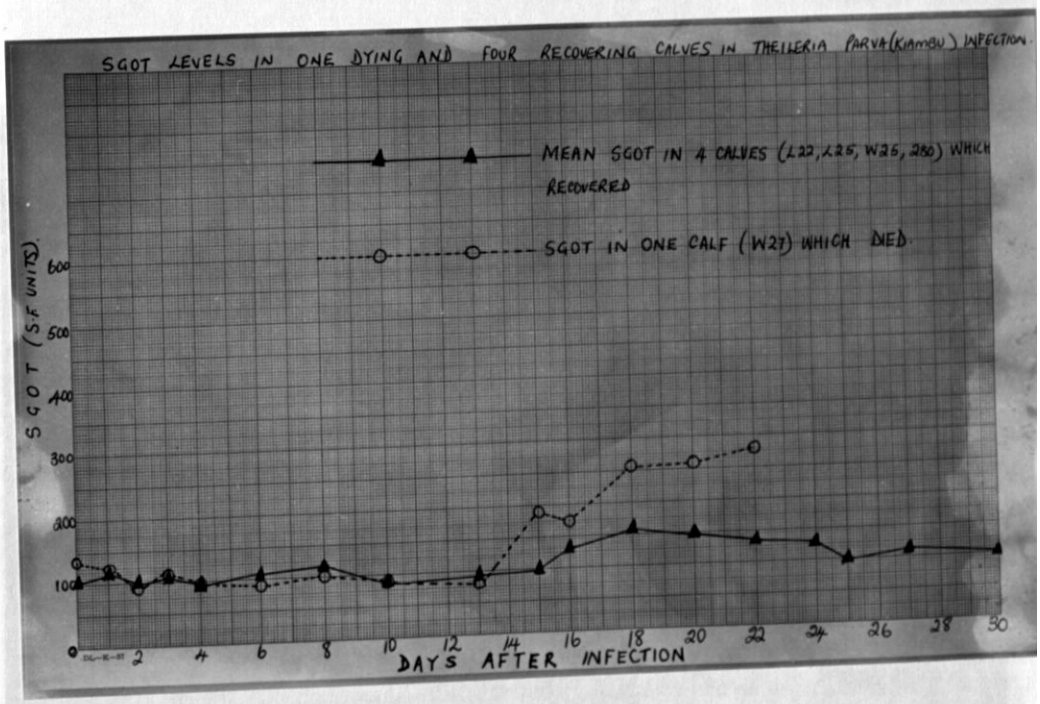


Fig. 36. Comparing SGOT changes in one dying and four recovering calves in Theileria parva (Kiambu) infection.

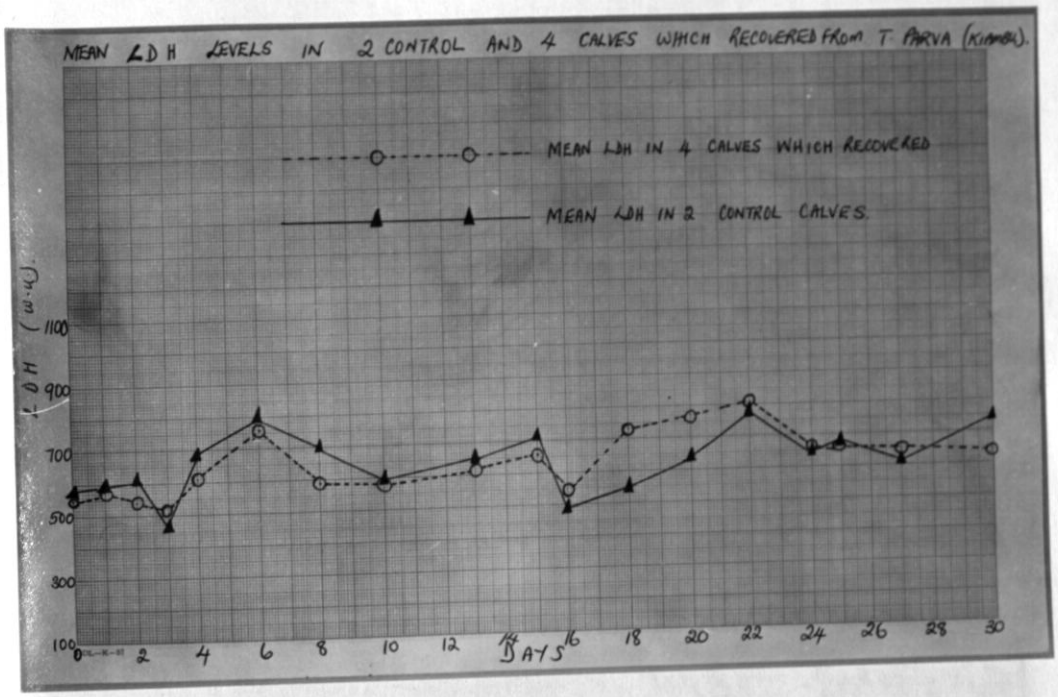


Fig. 37. Mean LDH levels in two control and four calves which recovered from Theileria parva (Kiambu) infection.

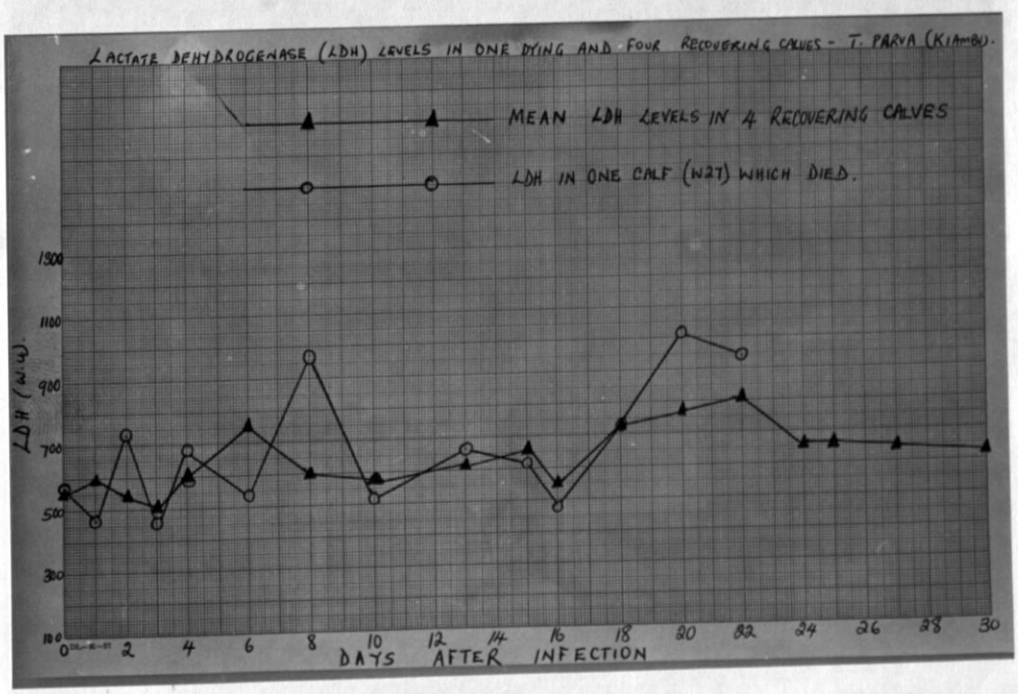


Fig. 38. Comparing LDH changes in one dying and four recovering calves, Theileria parva (Kiambu) infection.

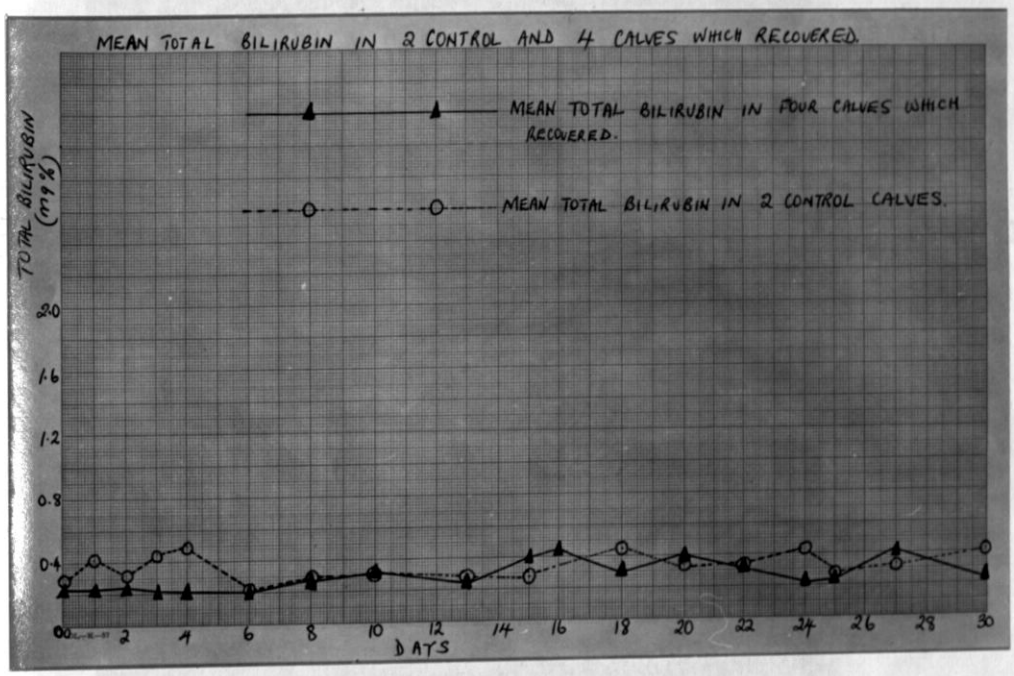


Fig. 39. Comparing mean total bilirubin in two control calves and four calves recovering from Theileria parva (Kiambu) infection.

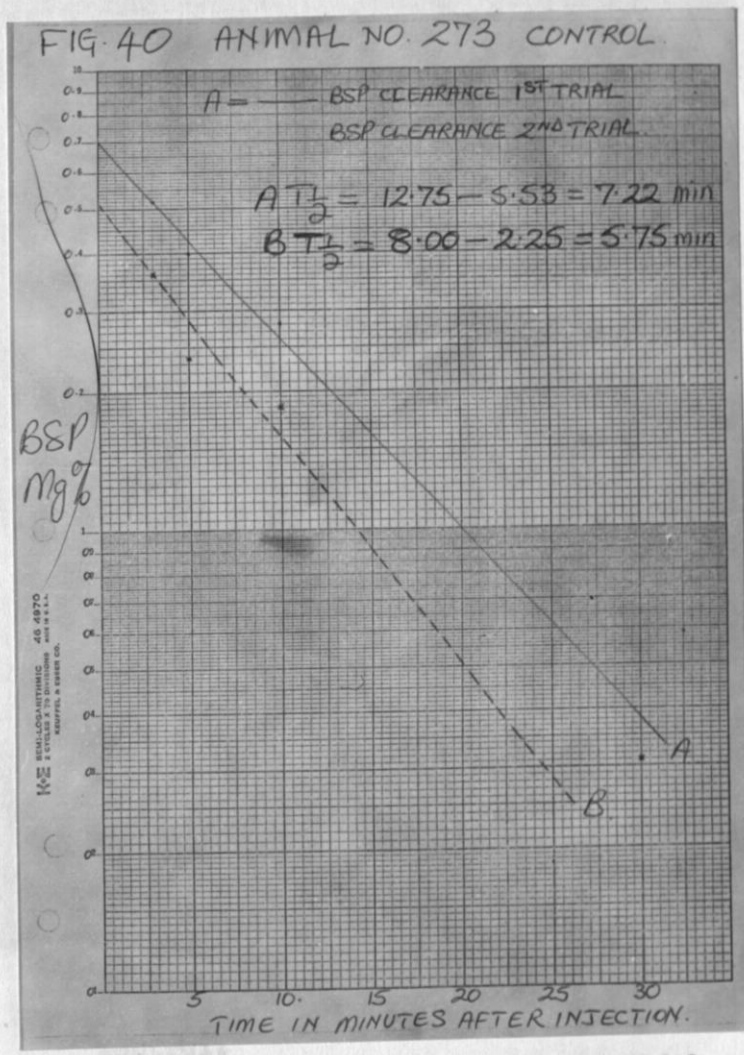


Fig. 40. B.S.P. clearance in calf 273 which acted as control.

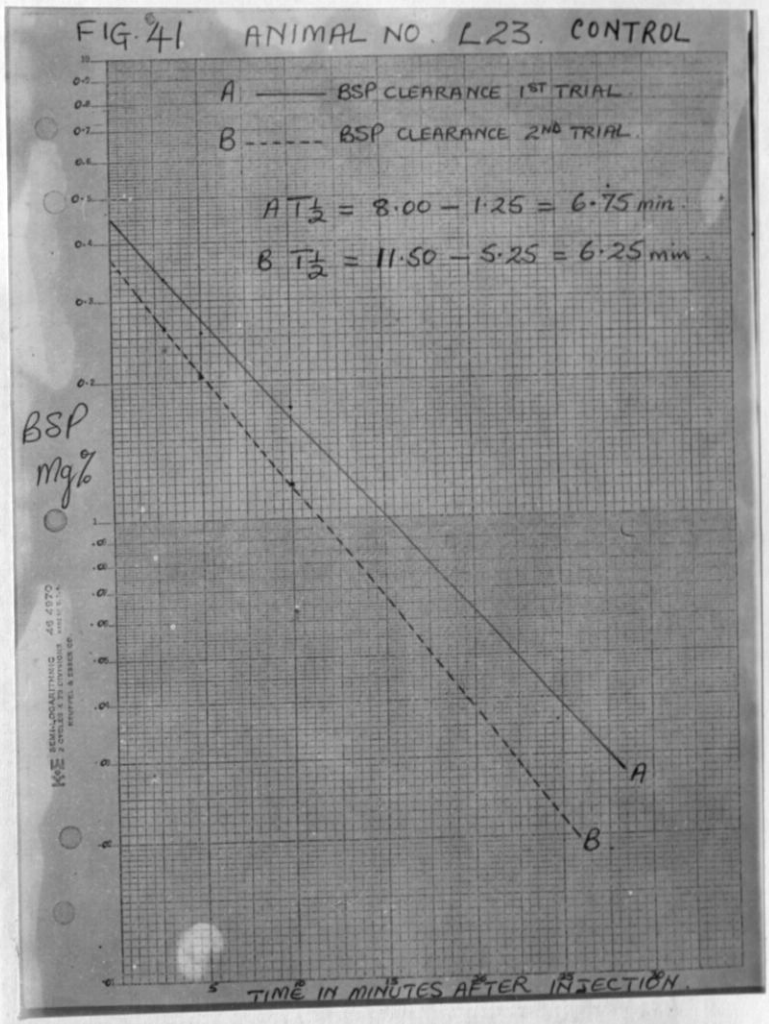


Fig. 41. B.S.P. clearance in calf L23 which acted as control.

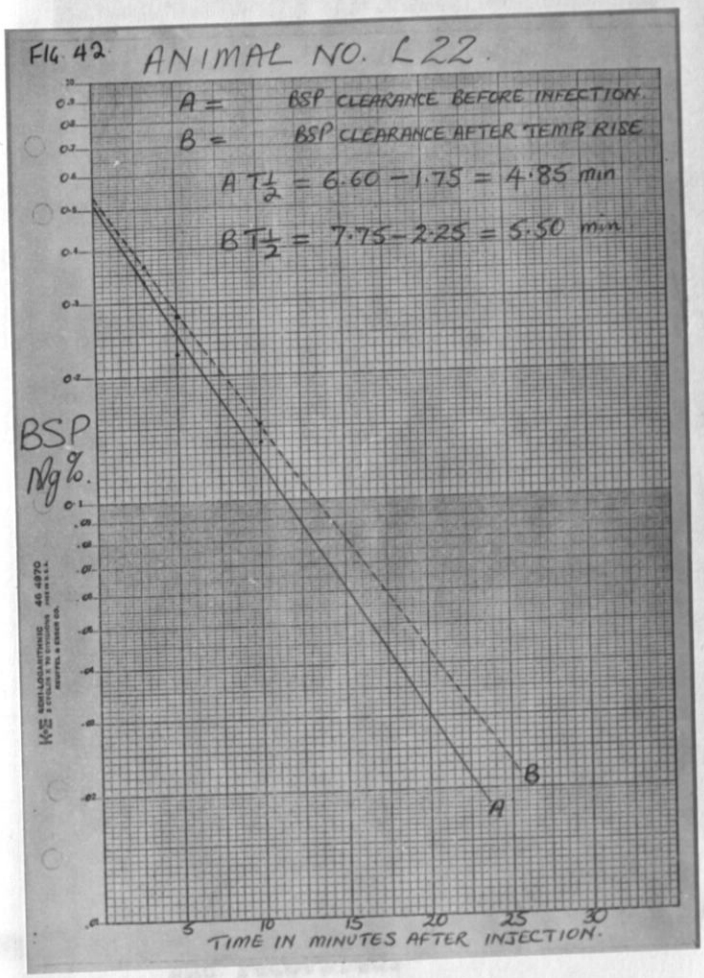


Fig. 42. B.S.P. clearance in calf L22 which reacted severely but recovered later.

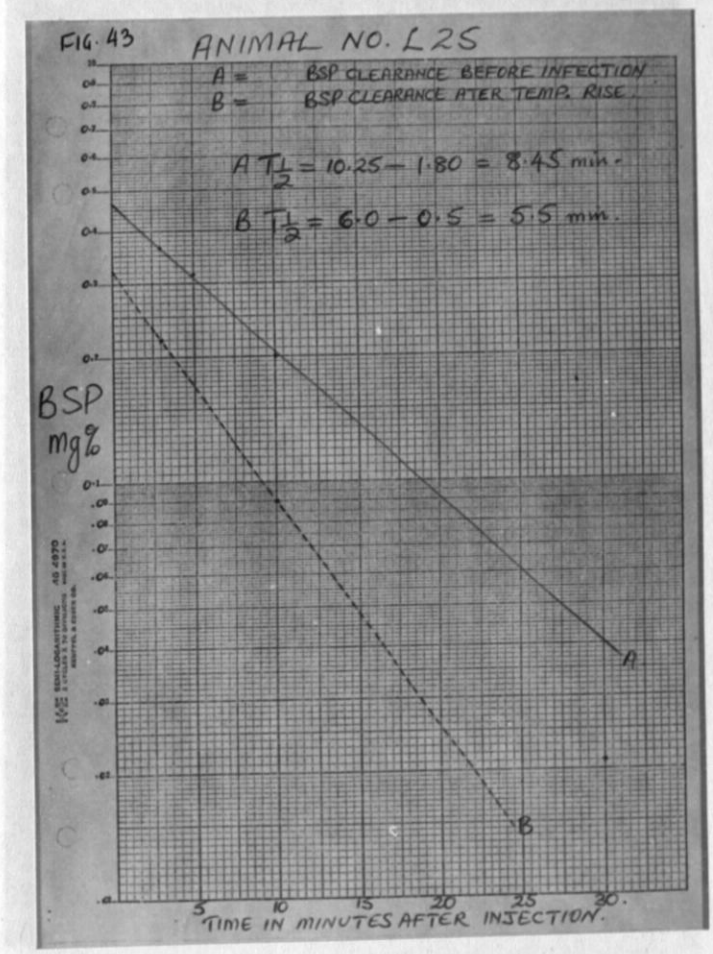


Fig. 43. B.S.P. clearance in calf L25 which reacted mildly and recovered.

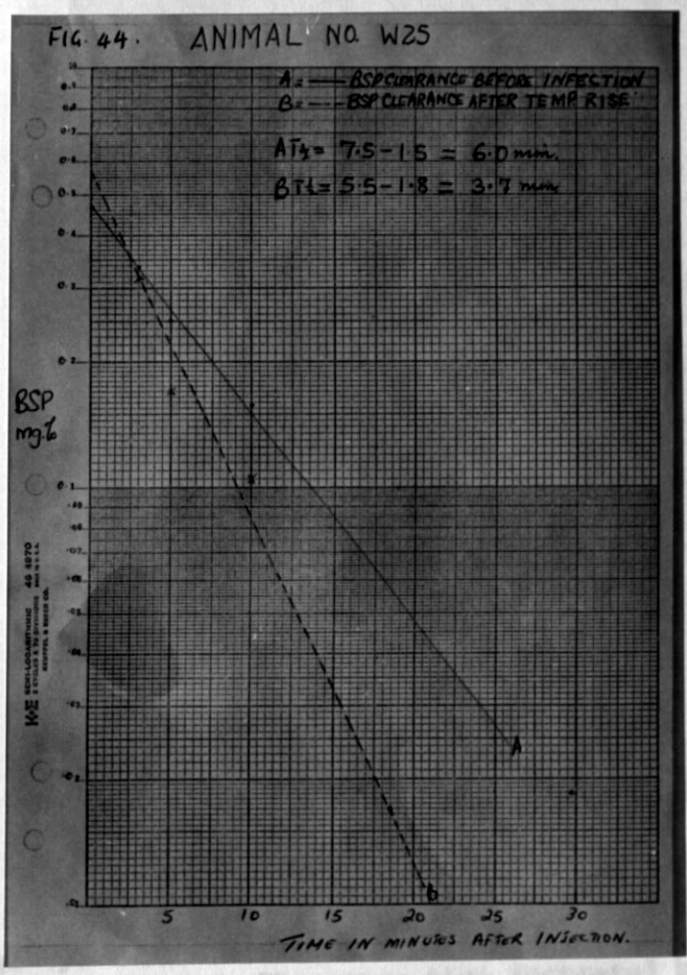


Fig. 44. B.S.P. clearance in calf W25 which reacted mildly and recovered.

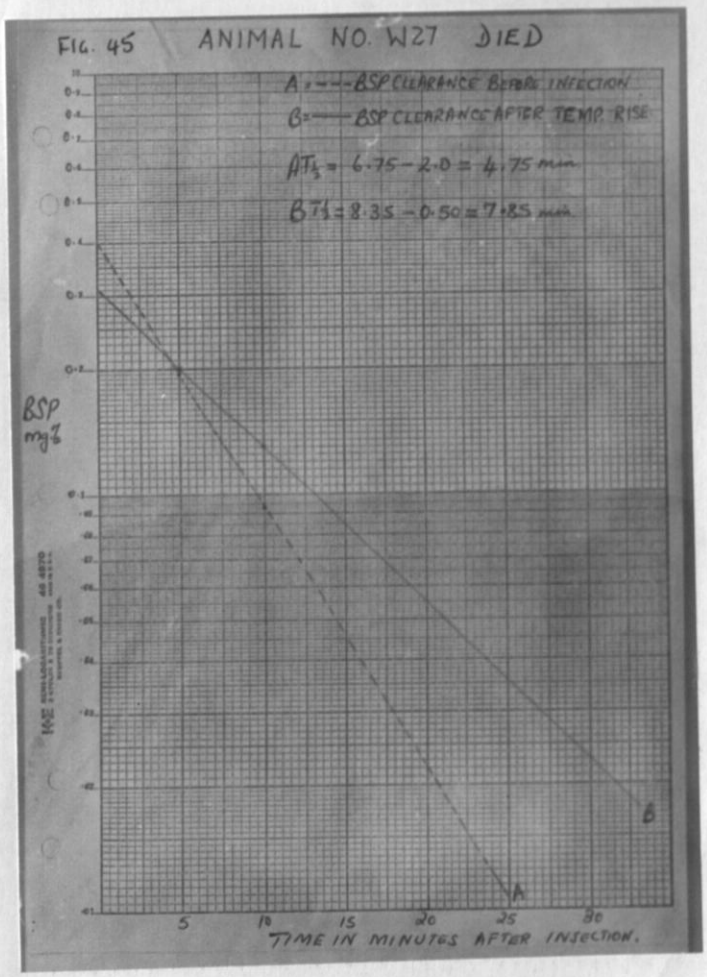


Fig. 45. B.S.P. clearance in calf W27 which died of East Coast Fever. Clearance time increased by only 3.10 minutes.

DISCUSSION

DISCUSSION FOR THEILERIA PARVA (MUGUGA) STABILATE 44 AND THEILERIA PARVA (KIAMBU) STABILATE 32

The disease produced by these strains ranged from the acute to inapparent infections described by Neitz (1957). The disease in calves infected with Theileria parva (Muguga) undiluted stabilate was acute with 100% mortality while the diluted stabilate produced a mild disease with 40% mortality. Two calves in the latter infection had an acute disease. Theileria parva (Kiambu) gave a mortality rate of 20% and the calves suffered acute, subacute, mild and inapparent infections. Calves in the last three categories recovered.

The incubation periods varied from 8-14 days. This period is within that recorded by Brocklesby (1962). The febrile reaction period for the calves which died of the acute disease varied between 7-13 days which agrees with the 7-18 days reaction period recorded by Brocklesby (1962). Signs of the acute disease were as described by Neitz (1957). The latter author and others (Dixon, 1910 and Henning, 1956) recorded temperature as the first sign of clinical disease. Other signs were observed later in the course of the disease. Careful observation in this work has shown that right ear gland which was the regional lymph node to the site of infection, was enlarged before temperature elevation. With elevation of temperature, the calves became dull and coats were stary. Other peripheral lymph nodes were swollen within three days after febrile reaction. There was a

gradual loss of appetite and a serous to mucopurulent nasal discharge. Pulse and respiratory rates were increased. Respirations became harsh and dyspnea was severe terminally. A dry cough which developed became moist before death. Diarrhea was terminal and developed within three days prior to death. Diarrhea was mixed with blood in two calves, one infected with Theileria parva (Muguga) and the other with Theileria parva (Kiambu). Slight dehydration was recorded in some calves. Petechiation of the visible mucous membranes appeared after 5 days post-temperature rise. This sign was not mentioned by previous authors (Neitz 1957 and Henning 1956) who were mainly describing signs of South African "strain" of Theileria parva. Corneal opacity was observed in the calf which died of Theileria parva (Kiambu) infection. This sign was also mentioned in East African Agricultural Report of 1947. Another rare sign mentioned only by Neitz (1957) was swelling of the head region. The swelling observed in this work was edematous involving mainly the right side where inoculation was done. Regression of the enlarged lymph nodes was consistent in this research as was also recorded by Barnett (1960).

A subacute disease described by Neitz (1957) was seen in calf L22 infected with Theileria parva (Kiambu). The high fever persisted for 18 days. During this period, all the signs of an acute disease were present including diarrhea and petechiation of mucous membranes. The latter were also pale. Due to loss of condition and hindquarter

weakness, this calf became recumbent and died of bacterial pneumonia and peritonitis 82 days later.

A mild disease was observed in three calves infected with the diluted stabilate of Theileria parva (Muguga) and two calves infected with Theileria parva (Kiambu). There was a fever lasting 2-9 days. Remission of fever was observed in two calves. This remission was also recorded by Brocklesby (1962). Lymph nodes were enlarged and later regressed. The calves were dull with stary coats and one developed anemia with pale membranes and a rapid weak pulse. Barnett (1957) reported a mild disease in which the animals were listless with enlarged lymph nodes. A mild fever persisted for 3-7 days. Mild infections were also reported by Barnett et al. (1961 and 1966). The mortality rates in these infections were 23% and 25%. The authors observed that the severity of the disease varied with the number of infected ticks attached which is much the same as diluting stabilate of infective particles carried out in this research.

An inapparent disease described by Neitz (1957) was encountered in one calf infected with Theileria parva (Kiambu). The only sign of infection was the presence of macroschizonts in the right ear gland.

Leukopenia was observed in all sick calves. The lowest recorded total leukocyte count among the recovering calves was 2800 WBC/Cmm of blood. The leukopenia was progressive in all dying calves. The drop in leukocytes started 2-11 days after temperature reaction. Barnett (1960) made the same

observation. He recorded leukopenia as starting 2-7 (Av. 4) days after onset of Fever. Barnett (1960) further observed that animals whose leukocyte dropped down to 1000 WBC/Cmm died within 1-2 days. In this present work calves whose leukocytes fell below 2000 cells/Cmm died within 2-10 days (Av. 5). Steck (1928) observed that if leukopenia was extreme, animals failed to recover. One of the calves which had high leukocyte count even before inoculation was, at post-mortem, discovered to have a liver abscess. Leukopenia also developed in the latter calf supporting Wilde (1963) who failed to induce leukocytosis using Haemophilus pertussis bacterin in animals sick with East Coast Fever. Drop in leukocytes involves all leukocytes making this a panleukopenia also described by several authors (Strickland 1916, Steck 1928, Barnett 1960, Wilde 1963, Brown et al. 1965 and Munyua 1971).

Macroschizonts were recovered from the local lymph nodes on average 4 days preceding temperature reaction. While Barnett (1960) saw the same parasites in regional lymph node 3 days after enlargement of the latter. Macroschizonts were seen in other peripheral lymph nodes on the first or second day after temperature elevation. Barnett (1960) reported the same finding. Few macroschizonts were encountered in mildly reacting calves and these were limited to the febrile period.

Piroplasms were present in the blood 2-3 days after temperature reaction. Radley (1970) reported that

piroplasms appeared in the blood 12-13 days after infection and he also observed that animals which died on or before day 13 did not have piroplasms in their blood. In this work piroplasms were seen in the blood smears 11-15 days after infection. The finding of piroplasms within 3 days after temperature elevation was quite constant. In the recovering calves, piroplasms persisted in the blood of some calves upto ten days possibly explaining what Barnett et al. (1966) described as a persistence of infection.

A slight degree of anemia was encountered in the calves which lived beyond day 18 after infection. Anemia was intense in two calves (279 and L22). Calf 279 was splenectomized after the disappearance of piroplasms from the blood. It died 3 weeks later of acute babesiosis. The latter period was adequate for a splenectomized calf to contract babesiosis and die from it. Slight anemia has also been reported by Neitz (1948), Wilde et al. (1968) and MUnyua (1971). The latter two authors observed anemia in protracted cases of East Coast Fever.

A slight decrease of serum total proteins was recorded in most sick calves. The drop in serum total proteins was more marked in calf W27 and was due to a decrease in serum albumin. Munyua (1971) recorded no decrease in total serum proteins.

Blood urea nitrogen (BUN) was significantly increased in one calf. Three other calves which died of Theileria parva (Muguga) had slight elevation of BUN. This parameter

is mainly used as an index of renal damage (Campbell 1970). Since Munyua (1971) observed degenerative changes in kidneys of calves dying of East Coast Fever, the elevation in BUN signifies such kidney damage.

Serum lactate dehydrogenase (LDH) was elevated in all the calves which died of East Coast Fever. LDH levels did not change in recovering calves. Calves whose LDH levels went above 1000 wacker units died. It was also noted that LDH levels rose sharply in the last two days in calves which died on or before day 15. Schindler et al. (1968) recorded increased LDH in animals sick with East Coast Fever. Boyd (1962) found high levels of LDH in bovines with liver necrosis which was observed by Munyua (1971) in bovine cases dying of East Coast Fever. This offers a possible explanation of the increased LDH activity.

High levels of serum glutamic oxalacetic transaminase (SGOT) in dying and slight increase in surviving calves was observed in this work. Munyua (1971) recorded only a slight increase in SGOT and related this to liver necrosis he subsequently observed at post-mortem. Neitz (1957) had observed muscular degeneration in East Coast Fever cases.

Serum alkaline phosphatase decreased slightly in some calves but otherwise remained normal. Barnett et al. (unpublished) found no significant trend in alkaline phosphatase of animals infected with East Coast Fever.

Gradual increase in total serum bilirubin was recorded in all calves dying of Theileria parva infection. Initially, the increase involved both direct and indirect bilirubin but terminally indirect bilirubin showed a sharp rise. Due to the foregoing observation, the sudden rise of indirect bilirubin possibly indicates a failure of the liver to conjugate the free bilirubin. The latter would be justified by liver necrosis observed by Munyua (1971) in calves which died of East Coast Fever. Garner (1953) demonstrated that liver necrosis resulted in elevated serum bilirubin. Schindler et al. (1968) and Barnett et al. (unpublished) observed increased serum bilirubin in East Coast Fever cases. The latter author observed an increase in indirect bilirubin. Calves which reacted and recovered did not have significant bilirubin increase.

Bromosulfophthalein (BSP) clearance increased in dying calves indicating a significant liver dysfunction.

SUMMARY:

All calves infected with undiluted Theileria parva (Muguga) stabilate 44 died of East Coast Fever. The same stabilate diluted ten times produced 40% mortality in infected calves. Theileria parva (Kiambu) stabilate 32 killed 20% of infected calves.

The undiluted Theileria parva (Muguga) stabilate produced the acute disease described by Neitz (1957) while the diluted stabilate gave acute disease in two calves and a mild disease in 3 other calves. Theileria parva (Kiambu) behaved like the mild strain described by Barnett et al. (1961 and 1966). The Kiambu "strain" caused mortality. The rest of the calves had subacute, mild and inapparent infections.

Signs observed in this research but rarely reported in the literature included; edematous swelling of the head region, corneal opacity, regression of the enlarged lymph nodes, and grinding of teeth.

Panleukopenia was recorded in all the sick calves except in the one calf with an inapparent disease. Leukopenia was mild and reversed in recovering calves while animals whose leukocyte count went below 2000 WBC/Cmm of blood died.

Macroschizonts were detected in peripheral lymph nodes in addition to the regional drainage lymph node, on the first day of fever. Piroplasms were present in the blood two days later. The latter persisted in the

blood of recovering calves upto ten days after temperature became normal.

A slight degree of anemia was consistently recorded in this work.

Serum lactate dehydrogenase (LDH) changes were quite significant. No change was observed in recovering calves while calves whose LDH rose above 1000 wacker units died subsequently, suggesting liver damage to be significant to the prognosis.

Total bilirubin increased in all calves which later died of the infection. The increase in bilirubin involved both direct and indirect bilirubin except terminally when the latter increased sharply. Slight drop in serum total proteins was observed.

Bromosulfophthalein (BSP) clearance time increased in calves reacting severely indicating severe liver damage.

GENERAL DISCUSSION

GENERAL DISCUSSION

Three strains of Theileria parva were used in this work. These were, Theileria parva (Aitong) and (Kiambu) as field strains and Theileria parva (Muguga), a laboratory strain.

Theileria parva (Kiambu) produced a mild disease as described by Barnett et al. (1961 and 1966) with a mortality of 20%. This was almost similar to the disease produced by the diluted stabilate of Theileria parva (Muguga) where mortality was 40%. This apparently wide margin in mortality rates was due to the small number of calves used (5 calves) in each infection. That the diluted stabilate produced a mild disease with recoveries supports the work of Cunningham et al. (1970) who found similar results with diluted stabilates. Although experiments with Theileria parva (Aitong) were not done beyond the preliminary stage, the two calves infected with this strain died from an acute East Coast Fever indistinguishable clinically from the disease produced by the undiluted stabilate of Theileria parva (Muguga).

Incubation and reaction periods of all infected calves which died of East Coast Fever agreed with those recorded by Brocklesby (1962). Acute disease described by Neitz (1957) was observed with the infections of undiluted Theileria parva (Muguga) and Theileria parva (Aitong). Signs not reported by Neitz but were consistently recorded in the acute disease included; petechiation of visible

lymph nodes, grinding of teeth and shivering. Corneal opacity was seen in one calf infected with Theileria parva (Kiambu). The latter sign was also recorded in East African Agriculture Journal of 1947. Another rare sign recorded in 20% of the sick animals was an edematous swelling mostly on right side of the head starting from the inoculation site. The swelling was also reported by Neitz (1957).

A subacute disease as described by Neitz (1957) was observed in one calf infected with Theileria parva (Kiambu) in which febrile reaction persisted for 18 days. During the reaction, the animal developed all the signs of acute disease. There was pallor and petechiation of mucous membranes. Hindquarter weakness and a poor condition forced the calf to become recumbent.

A mild disease was encountered in 3 calves infected with Theileria parva (Muguga) diluted stabilate and 2 calves infected with Theileria parva (Kiambu). Febrile reaction periods ranged from 2-9 days. Remission of fever occurred in two calves with Theileria parva (Kiambu) infection. Remission of fever was also described by Brocklesby (1962). Other signs observed were dullness, stary coats and swelling of superficial lymph nodes. This type of disease was originally described by Neitz (1957).

The macroschizont index and piroplasm parasitaemias remained low in these mildly affected calves.

One calf (280) infected with Theileria parva (Kiambu) suffered an inapparent disease described by Neitz (1957). The only sign of disease was the presence of few macroschizonts in the right parotid lymph node (gland local to the site of infection).

Leukopenia was consistently observed in all the infected calves except in the one that ran an inapparent infection. This is a finding extensively described in the literature (Strickland, 1916; Steck, 1928; Barnett, 1960; Wilde, 1963 and 1967; Brown et al., 1965 and Munyua, 1971). The observation that it involved all leukocytes is not new as it has already been described by Steck (1928) and Wilde (1963). Where the disease was very acute and the calves died after 13 and 15 days, the drop in leukocytes was observed to coincide with the elevation of temperature. In the other sick animals commencement of leukopenia occurred in the period of 2-11 days after temperature rise. Barnett (1960) described this period as 2-7 days (Average 4). The reversed leukopenia in the recovering calves was also reported by Wilde (1963). Steck (1928) observed that if leukopenia was extreme animals failed to survive. Barnett (1960) defined this extreme as 1000 cells per cubic millimeter of blood. Animals attaining such a level died in 1-2 days. In this work, the lowest WBC count in the recovering calves was 2800 cells/Cmm. A drop below 2000 WBC/Cmm was taken to indicate a hopeless prognosis. This level

of leukocytes was observed 2-11 (Av. 5) days before the calves died.

A slight degree of anemia was recorded in all the infected calves which lived beyond day 18 except calf 280. Theileria parva (Aitong) in this respect was not different from either Theileria parva (Muguga) or Theileria parva (Kiambu). The marked anemia observed by Snodgrass et al. (1972) with Theileria parva (Aitong) was not observed in this work. In this research, two calves, calf 279 infected with Theileria parva (Muguga) diluted stabilate and calf L22 infected with Theileria parva (Kiambu) showed marked anemia. The former which was splenectomized three weeks after recovery died later of acute babesiosis. Blood slides examined throughout and after patent East Coast Fever had revealed no babesia organisms. The other calf (L22) died after a prolonged recumbency and was found to have a liver abscess at post-mortem. Henning (1956) and Wilde (1967) described anemia as insignificant. Results of this work support those of Brown et al. (1965) and Munyua (1971). These two authors report a slight degree of anemia observed in protracted cases of East Coast Fever.

Though a definite and pronounced thrombocytopenia was observed by Wilde et al. (1965), no such changes was recorded in this work. Levels of circulating platelets remained normal.

Macroschizonts were seen in the local lymph nodes on average 3-6 days before temperature rise.

Barnett (1960) found these parasites in the local drainage lymph node 3 days after enlargement of the latter. It is rather difficult to relate this finding to the above observation in this work as the author did not indicate when enlargement of the local lymph gland occurred. The same author also saw macroschizonts on the first day of fever which was recorded in this research. These parasites increased steadily towards death. The macroschizont index of the recovering calves remained low and these parasites were absent in lymph smears, shortly after temperature dropped below 103°F.

Piroplasms were present in the blood earlier than Radley (1970) recorded. The latter observed the piroplasms from day 13 onwards. In this work, piroplasms were seen as early as day 10 after infection. These parasites were consistently found in the blood 2-3 days (Av. 2.5) after temperature rise. Piroplasm parasitaemia followed the same pattern as MSI. In recovering calves piroplasms persisted in the blood upto 10 days. This probably accounts for what Barnett et al. (1966) recorded as a "persistence of infection in recovered animals".

Serum total protein levels were slightly decreased in calves whose disease course was more than 15 days. Reduced protein levels were due to decrease in serum albumin except in some calves where serum globulins also decreased. Barnett et al. (Unpublished) described a drop in serum proteins due to a decrease in globulins. Schindler

et al. (1968) differs from the latter authors. He described an increase in α_2 and β globulin while Munyua (1971) did not observe any change in serum proteins.

Blood urea nitrogen (BUN) was significantly elevated in two calves in the whole of this work. Slight increases were encountered in three other calves. This parameter is usually measured as an index of renal damage (Campbell, 1970) and Munyua (1971) had observed some degenerative changes in the kidneys of calves dying of East Coast Fever. The latter information is a possible explanation of the elevated BUN.

The serum electrolytes estimated in the preliminary experiments (Sodium, Potassium and Chloride) were decreased slightly in some calves which developed a diarrhea.

Serum alkaline phosphatase showed decreasing levels in some dying calves. This enzyme was included in this research mainly as liver function test. Garner (1952) warned on the use of the enzyme as a liver function test as it had a wide range even in normal cattle. Barnett et a. (Unpublished) found no significant trend in alkaline phosphatase levels. The decrease in alkaline phosphatase recorded in this work is difficult to explain, but presumably could be due to decreased osteoblastic/osteoclastic activity.

Serum bilirubin was elevated in calves which died of East Coast Fever. Sharp increase in bilirubin to levels above one milligramme per 100 ml of serum was observed terminally in some dying calves. This sharp increase was

due mainly to increased indirect reacting bilirubin suggesting a hemolytic component to the disease. Roets (1943), Schindler et al. (1968) and Barnett et al. (Unpublished) also report increased serum bilirubin in East Coast Fever. Barnett et al. further observed that the increase was mainly due to non-conjugated (or indirect) bilirubin. Garner (1953) demonstrated increased bilirubin in severe bovine liver necrosis. Munyua (1971) recorded liver necrosis in animals dying of East Coast Fever. This finding explains the sharp increase in non-conjugated bilirubin signifying a decrease uptake of free bilirubin by the liver cells. There was no significant change in bilirubin levels of calves which reacted mildly and recovered. The test therefore seems to be a good indication of the severity of the disease.

Serum glutamic oxalacetic transaminase (SGOT) was increased in all sick calves. High levels of the enzyme were encountered in dying calves. Recovering animals had their SGOT elevated over the febrile period but reversed after recovery. Munyua (1971) found slight elevation in SGOT in animals suffering from East Coast Fever. Schindler et al. (1968) also reported increased SGOT in infected calves. Liver necrosis observed by Munyua (1971) and occasional muscular degeneration (Neitz, 1957) seen in East Coast Fever cases explains the observed increase in the enzyme.

Serum lactate dehydrogenase (LDH) levels were elevated in the sick calves which died of East Coast Fever.

LDH levels remained unchanged in sick recovering calves. Schindler et al. (1968) recorded elevated LDH levels in cattle suffering from East Coast Fever. Since Boyd (1972) demonstrated elevated serum LDH in bovine liver necrosis and the latter was observed by Munyua (1971), the high LDH levels recorded in this work is possibly due to liver damage. Since LDH was elevated above 900 wacker units in all the dying calves the increase in this enzyme above that level could be taken to mean eventual death. This could be used to isolate the obviously sick animals which would go on to recover from East Coast Fever. However, further tests need to be done to establish this fact.

Bromosulfophthalein test (BSP) clearance time increased in all the calves which later died of East Coast Fever. This change was not observed in recovering calves except in one calf where slight increase was recorded. This test indicates a serious liver dysfunction which could also led to increases in bilirubin, SGOT and LDH levels.

SUMMARY:

Theileria parva (Aitong) which was one of the field strains used, gave an acute disease similar to that observed with Theileria parva (Muguga), a laboratory strain. Theileria parva (Kiambu) another field strain proved to be quite mild. The latter caused 20% mortality. The results obtained with the latter strain were comparable to those obtained with a stabilate of Theileria parva (Muguga) diluted ten times.

The incubation and febrile periods recorded with the infections of undiluted stabilates of Theileria parva (Muguga) conforms with those recorded by Brocklesby (1962). Mortality rate was 100% which shows the same virulence in susceptible animals as observed by Brocklesby et al. (1961). This strain of Theileria parva has not lost identity and virulence though it has been maintained in the laboratory for over ten years.

Clinical signs observed in this research but not commonly reported in literature included, swelling of the head, petechiation of the visible mucous membranes, grinding of teeth and corneal opacity. Regression of enlarged peripheral lymph nodes was consistent. Nearly all the previous authors who described clinical signs observed rise of temperature to be the first sign of disease. Enlargement of the local lymph node was observed to be swollen before temperature reaction.

Panleukopenia was present in all calves which became obviously sick. Calves whose leukocyte count decreased below 2000 WBC/Cmm of blood died of the infection.

Slight degree of anemia was present in calves with protracted disease.

Serum lactate dehydrogenase (LDH) and total bilirubin were only increased in calves which later died of the infection. Bilirubin elevation was due to increase in both direct and indirect bilirubin. The latter increased suddenly before calves died.

Serum proteins showed slight decrease due mainly to lowered albumin levels.

Blood urea nitrogen had significant increases in a few calves possibly indicating a failing kidney.

Serum glutamic oxalacetic transaminase (SGOT) was markedly elevated in dying animals. Those that recovered had a slight elevation over the febrile period.

Increased bromosulfophthalein (BSP) clearance time which was consistent in calves that died is a clear indication of the liver damage reported in literature.

The majority of the significant biochemical parameter changes (LDH, SGOT, Bilirubin, Total Proteins, BSP) reflect that liver damage and subsequent reduced function is a consistent observation.

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APPENDIX

KEY TO APPENDIX

BIOCHEMISTRY:

AP	-	Alkaline phosphatase
TP	-	Total Protein
A	-	Albumin
G	-	Globulin
A/G	-	Albumin-Globulin Ratio
SGOT	-	Serum glutamic oxalacetic transaminase
LDH	-	Lactate Dehydrogenase
TB	-	Total Bilirubin
Sig	-	Sigma Units
Gm%	-	Grammes per 100 ml. of serum
SF	-	Sigma - frankel units
W.U.	-	Wacker Units
Mg	-	Milligrammes

HAEMATOLOGY:

PCV	-	Packed cell volume
HB	-	Haemoglobin
RBC	-	Red blood cells
WBC	-	White blood cells
MCV	-	Mean corpuscular volume
MCHC	-	Mean corpuscular haemoglobin concentration
N	-	Neutrophil
ST	-	Stabs
L	-	Lymphocyte
E	-	Eosinophil
M	-	Monocyte
B	-	Basophil

APPENDIX I.

BIOCHEMISTRY AND HAEMATOLOGY IN PRELIMINARY EXPERIMENTS. THEILERIA PARVA (MUGUGA) STABILATE 21 AND T. PARVA (AITONG) STABILATE 20 INFECTIONS.

APPENDIX I A - BIOCHEMISTRY IN PRELIMINARY EXPERIMENT :

ANIMAL NO.	DAY	A.P. SIG.	T.P. gm%	A. gm%	B.UN. mg%	CL. mEq/L	NA. mEq/L	K. mEq/L	G. gm%	A/G RATIO
E.I.		2.0	6.0	3.00	<10	109.0	152.3	5.9	3.0	1.0
		1.45	6.25	2.95	<10	131.0	160.0	4.5	3.30	0.89
	0	2.07	6.00	2.45	<10	158.0	122.8	3.55	3.55	0.69
	1	1.75	6.15	2.00	<10	116.2	165.3	5.0	4.15	0.48
	2	1.45	6.0	3.35	<10	113.8	160.0	4.8	2.65	1.26
	3	1.60	5.83	3.27	<10	107.7	156.6	4.9	2.56	1.27
	5	1.25	5.70	3.26	10	128.8	152.3	4.4	2.44	1.34
	6	2.10	6.35	3.25	<10	123.0	187.1	4.9	3.10	1.05
	7	1.90	7.0	3.75	<10	103.0	147.9	3.8	3.25	1.15
	8	2.0	6.0	3.10	10	109.5	143.6	3.5	2.90	1.07
	9	2.12	5.05	2.80	10	104.8	130.5	4.6	2.25	1.24
	10	1.90	5.80	3.35	10	105.2	156.6	4.4	2.45	1.37
	12	1.25	5.50	2.95	10	109.5	139.2	3.8	2.55	1.16
	13	1.44	5.80	3.27	–	106.8	139.2	3.8	2.53	1.29
	14	0.75	5.80	3.10	15	121.5	147.9	3.8	2.70	1.15
	15	10.27	5.35	2.95	13	118.2	134.9	4.4	3.40	1.23
	16	0.50	5.79	3.15	13	119.3	139.2	4.1	2.64	1.19
	17	0.60	5.35	2.80	15	117.2	139.2	3.6	2.55	1.10

APPENDIX I A (CONT)

ANIMAL NO.	DAY	A.P. SIG.	T.P. GMS%	A GMS%	B.U.N. mg%	CL. mEq/L	NA mEq/L	K mEq/L	G GMS%	A/G RATIO
E 2		2.55	5.70	—	<10	113.0	6.4	169.6	2.90	0.96
		2.15	5.70	3.05	<10	127.6	5.2	152.3	2.65	1.15
	0	2.90	6.25	2.65	<10	123.5	5.9	147.9	3.60	0.73
	1	2.50	5.45	2.65	<10	109.5	5.8	174.0	2.80	0.95
	2	2.50	6.15	3.65	<10	114.9	5.4	152.3	2.50	1.46
	3	2.50	5.50	3.40	30	106.5	3.8	139.2	2.10	1.62
	5	2.30	5.35	3.35	15	105.0	4.6	169.6	2.00	1.68
	6	3.40	5.90	3.27	10	147.4	4.5	147.9	2.63	1.24
	7	3.05	7.15	3.90	10	116.8	3.5	156.6	3.25	1.20
	8	2.90	6.15	3.45	15	109.9	3.8	143.6	2.70	1.28
	9	2.35	5.35	2.80	15	108.0	3.5	130.5	2.55	1.10
	10	2.30	5.60	3.55	15	110.0	4.5	143.6	2.05	1.73
	12	1.15	5.35	2.95	13	107.0	4.4	110.9	2.40	1.23
	13	1.65	6.25	3.27	15	107.0	4.2	134.9	2.98	1.10
	14	0.75	5.80	2.95	15	121.0	4.1	145.7	2.85	1.04
	15	0.65	5.35	2.95	13	112.3	4.9	134.9	2.40	1.23
	16	0.60	5.50	2.95	13	113.4	4.6	160.0	2.55	1.16
	17	0.75	5.20	2.80	10	11.4	3.8	143.6	2.40	1.17
	19	1.05	5.20	2.85	15	112.8	3.6	121.8	2.35	1.21
	20	1.30	5.45	2.95	20	123.0			2.50	1.18
	21	1.50	4.65	2.85	25	118.4			1.80	1.58

APPENDIX I A (CONT)

ANIMAL NO.	DAY	A.P. SIG.	T.P. GMS%	A GMS%	B.U.N. mg%	CL mEq/L	NA mEq/L	K mEq/L	G GMS%	A/G RATIO
E.3	-3	2.1	6.00	3.55	<10	118.8	5.6	169.1	2.45	1.44
	-2	2.2	6.20	3.75	<10	115.0	5.0	165.3	2.45	1.44
	-1	2.45	5.50	3.20	<10	115.0	6.6	160.0	2.30	1.39
	0	2.30	5.75	3.50	<10	126.5	5.6	130.5	2.25	1.55
	1	1.62	6.29	4.25	<10	123.2	6.1	134.9	2.04	1.56
	2	2.15	6.15	3.75	<10	123.0	6.6	161.0	2.40	1.56
	4	2.25	5.75	3.60	15	116.5	5.6	141.4	2.15	1.67
	6	1.75	5.66	3.40	<10	112.0	5.8	156.6	2.26	1.50
	7	1.80	5.75	3.54	25	115.0	5.4	154.4	2.21	1.60
	8	4.20	6.15	3.43	15	113.0	5.9	174.0	2.72	1.26
	9	2.25	5.35	3.27	<10	110.0	-	-	2.08	1.54
	10	2.00	5.60	3.35	28	96.2	-	-	2.25	1.49
	11	1.50	5.45	3.54	25	105.9	4.6	162.0	1.91	1.85
	13	2.95	5.05	2.85	25	115.5	3.60	165.3	2.20	1.30

APPENDIX I A(CONT)

ANIMAL NO.	DAY	A.P. SIG.	T.P. GMS%	A. GMS%	B.U.N. mg%	CL. mEq/L	NA. mEq/L	K. mEq/L	G. GMS%	A/G RATIO
E.4		2.85	6.25	3.75	< 10	105.7	5.6	156.6	2.50	1.50
		2.95	6.25	3.75	< 10	108.8	4.7	169.6	2.50	1.50
		2.80	5.6	3.30	< 10	107.8	5.4	156.6	2.30	1.43
	0	2.75	5.90	3.55	< 10	133.5	5.8	152.3	2.35	1.51
	1	1.05	6.55	4.30	< 10	117.5	6.0	158.8	2.25	1.91
	2	2.45	6.45	3.85	< 10	119.0	6.1	162.0	2.60	1.44
	4	2.85	5.66	3.43	10	116.0	5.0	139.2	2.23	1.54
	6	2.65	5.83	3.60	10	111.2	4.9	160.0	2.23	1.60
	7	2.07	5.83	3.40	15	112.2	4.86	152.3	2.43	1.40
	8	2.30	6.45	3.50	20	115.0	5.4	178.4	2.95	1.19
	9	1.85	6.15	2.30	25	107.0	-	-	2.85	0.59
	10	1.55	5.75	3.54	32	120.5	-	-	2.21	1.60
	11	1.30	6.15	2.40	37	93.09	3.60	126.0	3.75	0.64
	13	2.85	6.15	3.27	85	83.5	2.30	165.8	2.88	1.14
	14	0.90	6.42	3.60	98	79.60	2.60	165.3	2.82	2.37
	15	3.45	4.90	3.45	88	88.6	2.30	160.0	1.45	2.37

APPENDIX I a (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. GM%	A GM%	G GM%	A/G RATIO	BUN mg%	K mEq/L	NA mEq/L	CL. mEq/L	SGOT S.F.	LDH W.U.	T.B. mg%
E.I.	0	1.20	5.85	3.30	2.52	1.31	< 10	5.50	158.80	115.50	62	400	0.04
CONTROL	1	1.65	5.95	3.50	2.45	1.41	< 10	5.90	174.0	113.90	64	540	0.038
	2	1.60	5.75	3.20	2.55	1.25	< 10	6.40	165.80	98.70	57	417.50	-
	3	1.55	6.00	3.35	2.25	1.48	< 10	6.40	161.00	62.00	61	333.50	0.037
	4	1.40	6.62	4.05	2.57	1.58	< 10	5.90	152.30	118.20	61	539.0	0.0509
	5	1.40	6.00	3.75	2.25	1.67	< 10	6.00	162.00	117.50	44	555.0	0.039
	6	1.15	6.15	3.35	2.80	1.20	< 10	5.60	147.90	117.00	85	435.0	0.033
	7	1.28	6.00	3.43	2.57	1.33	< 10	4.60	165.80	107.00	58	722.50	0.038
	8	1.30	6.00	3.40	2.60	1.31	< 10	5.00	169.60	112.20	67	547.5	0.028
	9	1.28	6.30	3.40	2.90	1.17	< 10	5.80	152.30	111.20	74	514.50	0.035
	10	1.60	6.40	3.60	2.80	1.29	< 10	-	-	116.00	58	476.50	0.0392
	11							-					
	12	2.05	6.00	3.45	2.55	1.35	< 10	5.00	156.60	116.00	69.50	582.0	0.0318
	13	2.10	5.83	3.45	2.38	1.45	< 10	4.30	165.80	122.40	74	500.0	0.0350

APPENDIX I A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	K. mEq/L	NA. mEq/L	CL. mEq/L	SGOT. S.F.	LDH. W.U.	T. Mg%
E.2	0	1.30	5.80	3.45	2.55	1.35	10	5.00	169.70	115.80	120	550	0.2
CONTROL.	1	3.35	6.10	3.60	2.50	1.44	10	5.80	167.50	107.80	110	652	0.3
	2	3.60	5.35	3.20	2.15	1.48	10	6.00	150.50	107.80	66	470	-
	3	2.35	5.75	3.55	2.20	1.61	10	6.00	161.00	115.0	50	387	0.5
	4	1.75	6.40	4.20	2.20	1.91	10	6.00	165.30	119.0	76	575	0.3
	5	2.00	6.35	3.65	2.60	1.40	10	5.60	165.30	115.0	67	600	0.1
	6	2.00	6.00	3.54	2.46	1.44	20	4.60	139.20	112.2	64	543	0.2
	7	2.10	5.56	3.43	2.23	1.54	10	4.60	150.50	109.50	64	531	0.2
	8	2.00	5.66	3.35	2.31	1.45	10	5.00	161.00	112.0	62	505	0.1
	9	2.00	5.95	3.35	2.60	1.29	10	5.40	161.00	116.0	85	522.5	0.
	10	2.30	6.10	3.75	2.35	1.60	10	-		107.00	72	545	0.
	11							-					
	12	2.30	6.00	3.45	2.55	1.35	10	4.10	116.40	123.50	69.5	636	0.
	13	2.55	5.85	3.54	2.29	1.55	10	4.60	158.80	124.30	80.0	555	0.

APPENDIX I A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G RATIO	BUN Mg%	K. mEq/L	NA mEq/L	CL mEq/L	SGOT. S.F.	LDH. W.U.	T.B. Mg%
B.94	0	2.35	6.95	2.65	4.30	0.62	17	5.9	117.4	107.3	67	455	-
CONTROL.	1	1.90	6.25	3.05	3.20	0.95	∠10	4.5	156.6	117.5	80	316	0.35
	2	2.30	6.15	2.40	3.75	0.64	∠10	4.5	152.3	114.70	72	318	0.33
	3	2.30	6.00	2.95	3.05	0.97	∠10	5.10	162	106.4	100	384	0.38
	4	2.35	6.00	3.27	2.73	1.20	30	5.0	152.3	99.2	69.5	318	0.44
	5	2.35	6.15	3.40	2.75	1.24	25	4.50	158.8	103.8	85	408	0.48
	6	3.25	6.80	3.45	3.35	1.03	15	4.50	137.0	100.7	82	369	0.75
	7	2.90	6.15	3.45	2.70	1.28	20	2.80	134.9	95.5	76	341.3	0.47
	8	2.75	6.60	3.75	2.85	1.32	∠10	5.00	139.2	105.3	70	535	0.70
	9	1.70	6.45	3.75	2.70	1.02	10	5.4	134.9	106.8	97	486	0.83
A.100	0	1.90	6.85	2.40	4.45	0.54	∠10	6.4	134.9	111.00	86	470	-
CONTROL.	1	1.75	6.45	2.95	3.50	0.84	∠10	5.0	152.3	118.2	90	330	0.04
	2	2.30	6.60	2.30	4.30	0.53	∠10	4.70	141.4	144.0	87	414	0.02
	3	2.10	6.80	2.55	4.25	0.60	∠10	5.60	156.60	113.4	100	474	0.04
	4	1.50	6.00	3.25	2.75	1.18	10	4.30	165.30	100.5	80	435	0.22
	5	2.15	6.40	3.27	2.13	1.54	15	5.00	150.5	117.2	85	416	0.02
	6	2.75	6.70	3.20	3.50	0.91	15	3.80	113.6	108.2	82	341.30	0.0
	7	2.15	6.45	3.20	3.25	0.98	10	3.60	152.3	108.8	76	408.8	0.0
	8	2.15	6.60	3.55	3.05	1.16	-	5.40	143.6	108.6	70	650	0.0
	9	1.44	6.45	3.27	3.18	1.03	∠10	4.30	139.9	117.4	120	709	0.0

APPENDIX IB CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
E 3	-3	30.5	6.4	8.6	5.72	6.2	52.5	28.3	15	0	85	0	0	0	770
	-2	36.0	6.6	13.2	9.12	10.7	39.2	36.4	16	0	79	1	4	0	670
	-1	35	6.0	12.6	8.44	9.0	41.6	36.0	13	0	78	0	5	0	650
	0	36	6.2	11.4	7.72	8.8	46.7	40	15	0	78	0	3	0	920
	1	34	6.6	10.8	8.58	9.2	39.2	31.4	29	0	69	1	0	0	640
	2	34	6.6	10.1	8.59	7.8	39.2	39.8	24	0	74	2	0	0	450
	4	36	6.8	10.9	8.60	7.4	42	30.5	27	0	70	2	1	0	410
	6	36	6.3	12.6	8.69	4.8	41.5	35	22	0	73	2	1	0	350
	7	32	6.6	10.8	8.99	3.7	35.4	34	32	0	67	0	1	0	390
	8	34	6.8	12.1	9.57	3.6	35.2	35.3	21	0	76	0	1	0	510
	9	35	6.4	11.8	9.99	4.3	35.0	33.3	43	1	56	0	0	0	640
	10	39	6.4	12.5	9.05	3.6	43.2	32.0	23	0	72	4	1	0	670
	11	35	6.0	12.4	9.83	4.3	35.3	35.2	16	2	85	0	0	0	500
	13	42	6.0	13.5	9.18	2.2	45.4	32.1							650

APPENDIX IB CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELET /Cmm x 10^3
E 4	-3	38	7.2	14.2	8.58	9.7	44.2	37.2	25	0	75	0	0	0	450
	-2	35	6.4	11.6	8.71	10.5	40.1	33.1	26	1	61	1	2	0	501
	-1	35	6.4	12.6	10.9	9.5	32.1	36	36	0	64	0	0	0	640
	0	39	6.3	13.7	10.12	9.3	38.2	35.1	27	0	71	0	2	0	460
	1	34	7.0	10.9	8.00	8.7	42.5	32.0	32	0	66	2	0	0	460
	2	36	7.0	10.1	8.66	7.2	41.7	28	30	0	70	0	0	0	510
	4	34	6.6	10.0	8.30	7.0	41	29.5	30	0	68	0	2	0	470
	6	37	6.2	12.2	8.62	4.5	43	33.0	13	0	86	0	1	0	400
	7	35	6.6	11.7	8.37	4.3	42	33.2	25	0	74	0	1	0	430
	8	35	7.0	11.3	10.26	4.3	36.3	32.2	21	0	76	0	1	0	490
	9	39	6.6	11.9	9.73	4.5	40	30.3	23	0	72	2	0	3	350
	10	46	7.2	15.0	10.96	6.5	40	28.1	19	0	81	0	0	0	430
	11	45	7.4	14.2	10.76	7.6	41.7	31.2	15	0	85	0	0	0	550
	13	41	8.0	12.4	9.02	5.6	45.3	30.1	35	3	63	0	0	0	450
	14	44	9.2	13.5	10.45	3.3	42.3	30.3	21	2	78	0	0	0	460
	15	43	8.2	14.2	9.47	2.3	45.5	33							550

APPENDIX IB:

HAEMATOLOGY IN PRELIMINARY EXPERIMENT
THEILERIA (PARVA) AND (AITONG) INFECTIONS

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
E I	-2	34	6.6	11.5	8.73	11.2	39	33.7	20	0	79	1	0	0	710
	-1	30	6.6	10.5	8.12	9.9	37	35	27	1	73	0	0	0	700
	0	32	6.4	10.6	8.03	9.6	40	33	21	0	80	0	0	0	690
	1	30	7.2	10.2	7.63	8.3	39.3	35	30	0	70	0	0	0	650
	2	31	6.6	11.2	8.85	12.0	35	36.1	43	3	57	0	0	0	630
	3	29	6.4	9.7	7.49	7.7	38.7	33.5	15	2	84	0	1	0	640
	5	31	6.4	10.8	7.87	7.9	39	35	22	0	77	1	0	0	620
	6	29	6.6	10.4	7.23	6.4	40.2	35.8	13	1	87	0	0	0	850
	7	34	7.4	12.6	8.16	6.3	-	-	27	0	73	0	0	0	900
	8	30	7.0	10.7	7.59	4.1	39.6	35.6	15	0	85	0	0	0	870
	9	29	6.0	11.0	7.63	4.0	38.1	37.9	25	2	75	0	0	0	920
	10	27	7.0	10.0	6.71	4.0	40.3	38.4	22	1	78	0	0	0	900
	12	29	6.0	10.1	7.03	4.0	42	35	32	0	68	0	0	0	800
	13	27	6.2	9.2	7.16	1.67	37.5	34.5	47	0	53	0	0	0	690
	14	28	5.6	11.0	7.10	1.06	39.5	39.2							700
	15	27	6.6	8.6	6.61	0.74	41	31.0							720
	16	27	5.2	9.2	6.83	2.90	39	34							760
	17	27	6.2	9.3	6.35	3.0	42.5	34.5							670
	19	27	6.2	9.2	6.88	1.3	39.2	34							770
	20	26	6.1	9.2	6.73	1.17	38.8	35.4							650
	21	22	5.4	7.4	5.64	13.0	39.0	33.6							650

APPENDIX IB CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
E 2	-2	34	6.0	12.0	8.75	8.0	39	35	27	1	70	2	1	0	680
	-1	30	6.2	10.2	7.76	8.3	39	34	15	0	81	1	2	1	690
	0	34	6.8	11.1	8.58	8.2	40	33	18	0	82	0	0	0	700
	1	30	7.0	9.8	7.23	9.2	41.5	32.6	40	0	59	0	1	0	340
	2	32	6.4	11.5	8.71	14.0	36.8	36	57	3	42	0	1	0	350
	3	31	6.0	9.0	6.83	6.3	45	29	19	1	81	0	0	0	370
	5	29	5.9	9.5	7.22	7.4	40	33	30	0	69	0	1	0	390
	6	30	6.4	10.6	7.16	7.9	42	35.3	20	0	80	0	0	0	490
	7	38	7.3	11.6	7.76	6.3	40	34.0	7	0	93	0	0	0	520
	8	30	6.4	10.5	7.03	3.7	42.7	35.0	16	1	84	0	0	0	610
	9	30	5.4	10.0	7.10	3.1	42.3	33.3	21	1	79	0	0	0	700
	10	27	6.0	9.6	6.35	3.2	42.1	35.6	38	3	62	0	0	0	630
	12	28	5.8	9.7	6.83	2.0	42	34.5	34	1	66	0	0	0	610
	13	28	6.4	9.1	7.42	0.89	38	32.5							700
	14	28	5.4	9.2	7.36	0.44	38.5	33.0							760
	15	26	6.0	8.7	7.60	2.68	34.2	33.4							740
	16	27	4.6	8.2	6.96	0.92	38.8	30.4							680
	17	27	6.2	8.6	6.23	2.8	43.3	32.0							660
	19	24	6.0	8.1	6.41	1.7	37.5	33.8							700
				8.0	6.08	1.9	38.0	34.8							720

APPENDIX IB CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
E 1	0	31	5.8	11.5	7.76	12.0	38.3	37	10	0	86	3	1	0	600
CONTROL	1	32	6.6	11.1	8.56	12.7	37.2	34.3	20	0	78	1	1	0	590
	2	33	6.4	12.4	9.12	9.2	36.1	37.2	23	0	77	0	0	0	570
	3	34	6.2	11.4	8.31	9.4	41	34.2	14	0	85	0	1	0	700
	4	33	7.2	11.6	9.69	11.2	34.1	35.1	12	0	86	2	0	0	610
	5	33	7.0	10.8	8.46	13.4	39	32.0	12	0	87	0	1	0	750
	6	34	6.6	10.6	8.44	10.0	40.5	31.2	15	0	84	1	0	0	670
	7	34	6.6	10.8	10.3	7.9	33	31.4	25	0	74	0	1	0	440
	8	35	7.0	11.6	9.45	11.6	37	33.1	28	0	71	0	1	0	400
	9	32	6.4	11.0	8.99	10.3	35.3	28	17	0	83	0	0	0	730
	10	35	7.2	11.4	8.9	11.2	39	32.3	23	0	76	0	1	0	640
	11	38	7.0	11.6	10.12	10.0	37.6	30.5	14	0	83	3	0	0	590
	12	35	7.2	10.9	10.2	6.0	34.2	31.1	11	0	89	0	0	0	650
	13	33	6.5	11.0	9.26	7.3	35.4	33.1	15	0	84	1	0	0	840
E 2	0	32	6.4	7.9	5.88	8.0	54.5	24.3	14	0	86	0	0	0	430
CONTROL	1	33	6.4	11.3	8.99	11.2	36.4	34.1	21	0	76	0	3	0	400

APPENDIX IB NO. E2 CONTINUED

ANIMAL	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
E 2	3	34	6.0	11.7	9.71	10.9	35	34.2	21	0	79	0	0	0	670
CONTROL	4	35	6.6	11.6	10.26	9.9	34.2	33.0	24	0	73	0	2	1	520
	5	34	6.4	10.7	8.59	8.4	39.4	35.2	39	0	60	0	1	0	320
	6	35	6.5	10.5	8.50	7.8	41.2	30	26	0	71	1	2	0	490
	7	35	6.5	11.1	7.96	9.3	44	31.3	19	0	80	0	1	0	460
	8	35	6.8	10.9	10.17	9.5	34.2	31.1	19	0	79	0	2	0	480
	9	32	6.8	10.7	10.96	8.5	-	33.3	13	0	85	0	2	0	1000
	10	37	7.0	10.8	9.61	9.6	38.2	29.1	21	0	73	0	6	0	700
	11	36	7.2	14.8	10.02	9.3	36.0	41.0	18	0	78	0	3	1	650
	12	33	6.4	10.4	7.84	9.9	42	31.3	15	0	82	1	2	0	120
	13	35	6.6	11.0	7.79	11.1	45	31.2	23	0	75	0	2	0	710

APPENDIX IB CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
B 94 CONTROL	0	26	6.6	8.7	6.20	6.36	42	34	39	0	59	1	1	0	170
	1	22	6.4	7.9	5.74	6.70	38	36	32	0	66	0	2	0	-
	2	23	6.6	8.0	5.52	6.00	42	35	36	0	64	0	0	0	150
	3	23	6.8	8.0	5.40	5.9	42.6	34.7	41	0	57	0	2	0	380
	4	23	5.8	7.1	5.15	4.4	45	34	28	3	71	0	1	0	360
	5	23	6.0	7.9	5.58	5.5	41	34	25	0	74	0	1	0	350
	6	23	6.6	10.0	7.23	4.8	31.8	43.5	32	1	68	0	0	0	420
	7	22	6.4	7.8	4.83	6.2	45.6	35.5	36	0	64	0	0	0	650
	8	23	6.6	9.8	7.24	4.5	33	42.5	36	0	64	0	0	0	600
	9	26	7.0	10.3	7.85	9.25	-	-	32	0	68	0	0	0	500
A 100 CONTROL	0	32	6.8	11.5	8.39	5.5	38	36	30	0	68	0	2	0	120
	1	31	6.6	10.1	7.65	5.1	41	33	34	0	64	0	2	0	-
	2	33	6.8	9.7	7.10	5.0	47	29	32	0	63	1	2	0	135
	3	32	7.4	11.0	8.16	4.9	39.2	34.4	42	0	58	0	0	0	820
	4	28	6.2	8.0	5.64	4.0	50	29	34	0	66	0	0	0	-
	5	30	6.8	9.7	7.60	4.4	40	32	39	0	64	1	0	0	100
	6	31	7.0	8.3	5.52	5.5	56	26.8	28	0	72	0	0	0	400
	7	28	6.4	9.8	6.65	4.9	42.1	35	26	0	73	1	0	0	500
	8	20	6.2	8.2	5.25	5.60	-	-	21	0	79	0	0	0	660

APPENDIX 2:

THEILERIA PARVA (MUGUGA) STABILATE 44 UNDILUTED INFECTION.

BIOCHEMISTRY AND HAEMATOLOGY.

APPENDIX 2A - BIOCHEMISTRY IN FIVE INFECTED AND TWO CONTROL CALVES - THEILERIA PARVA (MUGUGA) STABILATE 44 UNDILUTED :

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT S.F.	LDH W.U	T.B. Mg%
251	-7	1.90	6.0	2.45	3.55	0.69	∠10	93	625	0.242
	-6	1.60	7.20	2.55	4.65	0.55	15	93	625	0.20
	-5	1.65	6.80	3.35	3.45	0.97	15	85	620	0.15
	-4	1.95	7.35	2.55	4.80	0.53	15	87	619	0.208
	-3	1.80	6.65	2.30	4.35	0.53	15	93	625	0.30
	-2	1.75	6.95	2.65	4.30	0.62	15	74	670	0.20
	-1	1.50	5.80	2.15	3.65	0.59	15	70	564	0.10
	0	1.75	6.55	2.35	4.20	0.56	10	82	626	0.16
	1	1.90	6.40	2.65	3.75	0.71	10	74	474	0.15
	2	2.85	6.65	2.90	3.75	0.77	10	77	604	0.15
	4	1.75	6.45	2.44	4.01	0.61	15	92	556	0.19
	6	1.40	6.95	2.95	4.00	0.74	10	53	628	0.25
	8	2.04	7.10	2.82	4.28	0.66	10	67	512	0.08
	9	1.40	6.40	2.46	3.94	0.62	12	72	474	0.15
	11	1.10	6.85	2.80	4.05	0.69	15	80	700	0.15
	13	0.95	5.95	2.80	3.15	0.89	15	140	828	0.20
	15	0.75	5.85	2.50	3.35	0.75	15	330	1272	0.30
	17	0.60	6.05	2.55	3.50	0.73	∠10	300	1120	0.20
	18	0.27	5.60	2.85	2.75	1.04	10	328	1188	0.32
	20	0.85	5.60	2.65	2.95	0.90	∠10	424	1420	0.38

APPENDIX 2A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN Mg%	SGOT S.F.	LDH. W.U.	T.B. Mg%
250	-7	2.00	6.5	2.70	3.80	0.71	10	-	642	0.29
	-6	1.90	7.0	2.90	4.10	0.71	15	-	604	0.27
	-5	1.85	6.60	3.30	3.30	1.00	15	110	610	0.29
	-4	1.75	6.95	2.70	4.25	0.64	15	89	588	0.25
	-3	2.05	6.85	2.65	4.20	0.63	10	74	595	0.20
	-2	2.70	6.65	2.65	4.00	0.66	15	105	673	0.25
	-1	1.65	6.15	2.85	4.30	0.66	15	90	590	0.25
	0	2.25	6.80	3.00	3.80	0.77	15	90	610	0.20
	1	1.90	6.30	3.10	3.20	0.97	10	80	626	0.25
	2	3.05	6.70	3.20	3.50	0.91	20	80	550	0.20
	4	2.20	6.70	2.70	4.00	0.68	15	85	484	-
	6	2.03	7.05	3.12	3.93	0.79	15	98	690	0.23
	8	2.19	7.25	3.15	4.10	0.77	10	72	502	0.25
	9	1.75	6.85	2.86	3.99	0.72	10	72	504	0.22
	11	1.35	6.70	3.05	3.65	0.84	15	50	474	0.150
	13	1.10	6.40	2.65	3.75	0.71	15	110	588	0.22
	15	0.95	6.70	2.48	4.22	0.59	15	345	1396	0.55
	17	0.60	6.00	2.25	3.75	0.60	30	420	1483	0.77
	18	1.65	5.50	2.60	2.90	0.90	35	536	1648	1.00

APPENDIX 2A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH W.U.	T.B. Mg%
252	-7	3.25	7.20	3.45	3.75	0.92	∠10	100	564.5	0.34
	-6	2.75	6.65	3.05	3.60	0.85	15	97	535	0.21
	-5	1.35	6.65	2.44	4.21	0.58	15	80	558	0.25
	-4	2.60	6.70	2.95	3.75	0.79	15	92	465	0.25
	-3	2.60	7.00	3.20	3.80	0.84	15	104	548	0.428
	-2	2.75	7.00	3.10	3.90	0.79	15	85	587	0.35
	-1	2.55	5.80	3.05	2.75	1.11	15	85	480	0.65
	-0	2.75	6.45	2.95	3.50	0.84	15	97	474	0.20
	1	2.75	6.00	3.10	2.90	1.07	10	85	420	0.10
	2	3.60	6.25	3.58	2.67	1.34	10	85	268	0.15
	4	2.65	6.65	3.20	3.45	0.93	20	82	420	0.15
	6	2.20	6.40	3.35	3.05	1.10	15	87	580	0.20
	8	2.44	7.20	3.65	3.55	1.03	12	67	440	0.23
	9	2.75	6.05	3.13	2.92	1.07	15	64	450	0.23
	11	2.75	6.05	3.30	2.75	1.20	15	87	550	0.20
	13	2.50	6.00	3.10	2.90	1.07	10	140	788	0.15
	15	1.40	5.95	2.95	3.00	0.98	15	330	1424	0.30
	17	0.90	6.25	2.85	3.40	0.84	20	390	1441	0.20
	18	0.70	5.70	2.95	2.75	1.07		340	1384	0.43

APPENDIX 2A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH W.U.	T.B. Mg%
253	-7	11.35	7.35	2.95	4.40	0.67	∠10	86	618	0.30
	-6	7.10	6.55	2.80	3.75	0.75	15	84	564.5	0.21
	-5	8.25	6.65	2.95	3.70	0.80	15	74	595	0.25
	-4	9.10	6.65	2.85	3.80	0.75	15	95	642	0.20
	-3	8.50	7.00	2.70	4.30	0.63	15	80	610	0.448
	-2	9.15	6.80	2.65	4.15	0.64	15	70	610	0.20
	-1	6.30	6.60	2.85	3.75	0.76	15	90	604	0.20
	0	7.00	6.80	3.00	3.80	0.79	15	85	610	0.16
	1	6.70	6.85	3.00	3.85	0.78	15	90	504	0.10
	2	7.80	6.55	3.10	3,45	0.90	15	85	492	0.15
	4	6.05	6.55	2.83	3.72	0.76	20	95	588	0.13
	6	5.30	6.85	3.25	3.60	0.90	10	77	688	0.23
	8	3.90	7.65	3.60	4.05	0.89	20	81	688	0.20
	9	3.70	6.85	2.96	3.89	0.76	15	76	534	0.25
	11	2.95	6.30	3.10	3.20	0.97	15	74	700	0.15
	13	2.90	5.85	3.45	2.40	1.44	20	300	2200	0.25
	15	2.00	6.40	2.75	3.65	0.75	30	420	1820	0.95

APPENDIX 2A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
258	-7	1.75	7.05	2.45	4.60	0.53	12	72	610	0.30
	-6	2.10	7.25	2.75	4.50	0.61	20	67	673	0.25
	-5	1.80	6.60	2.55	4.05	0.63	18	56	573	0.225
	-4	2.85	6.40	2.43	3.97	0.61	15	74	588	0.260
	-3	1.95	6.40	2.40	4.00	0.60	10	84	604	0.28
	-2	1.95	6.50	2.45	4.05	0.60	15	71	717	0.25
	-1	2.05	6.50	2.65	3.85	0.69	15	80	580	0.50
	0	1.80	5.95	2.55	3.40	0.75	15	77	550	0.25
	1	1.90	5.80	2.55	3.25	0.78	15	77	618	0.25
	2	2.90	6.05	2.85	3.20	0.89	15	61	474	0.30
	4	2.05	6.55	2.85	3.70	0.78	15	71	610	0.30
	6	2.25	6.55	3.10	3.45	0.90	15	61	764	0.20
	8	2.00	7.05	3.24	3.81	0.85	15	56	640	0.15
	9	2.10	6.55	2.80	3.75	0.75	15	53	434	0.25
	11	1.60	6.00	2.85	3.15	0.90	15	50	672	0.13
	13	1.65	5.95	3.05	2.90	1.05	20	100	714	0.15
	15	1.25	6.05	2.95	3.10	0.95	20	249	1080	0.40
	17	0.70	5.85	2.40	3.45	0.70	20	222	1204	0.55
	18	0.70	5.14	2.70	2.44	1.11	20	288	1128	0.92
	20	1.15	4.90	2.37	2.53	0.94	25	400	1352	1.25
	22	1.25	4.55	2.00	2.55	0.78	35	600	-	2.85

APPENDIX 2A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH W.U.	T.B. Mg%
B.97	-1	1.90	5.80	2.70	3.1	0.67	15	100	520	0.45
CONTROL.	0	2.00	6.25	2.80	3.35	0.83	15	80	534	0.60
	1	2.00	5.80	2.85	2.95	0.97	15	70	512	0.30
	2	2.50	6.05	3.10	2.95	1.05	15	90	572	0.40
	4	2.30	6.65	2.85	3.80	0.75	15	85	526	0.50
	6	1.25	6.80	3.15	3.65	0.86	15	87	556	0.40
	8	1.95	6.95	3.08	3.87	0.80	15	67	592	0.48
	9	2.05	6.70	3.13	3.57	0.88	15	85	634	0.40
	11	2.40	6.65	3.55	3.10	1.15	10	80	564	0.20
	13	1.60	6.55	2.85	3.70	0.77	20	73	488	0.20
	15	1.65	6.55	2.80	3.75	0.75	17	159	576	0.395
	17	1.60	7.10	2.95	4.15	0.71	40	285	556	0.35
	20	1.30	6.05	3.25	2.80	1.16	15	67	488	0.35
	22	1.60	6.30	3.05	3.25	0.94	18	77	-	0.20

APPENDIX 2 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
254	-1	1.90	6.45	3.05	3.40	0.89	20	95	492	0.10
CONTROL.	0	2.25	6.95	3.25	3.70	0.87	17	87	504	0.25
	1	2.10	6.40	3.10	3.30	0.93	15	82	556	0.30
	2	2.90	6.55	3.33	3.22	1.03	20	95	590	0.25
	4	1.90	7.05	2.95	4.10	0.72	15	94	600	0.30
	6	1.35	6.65	3.50	3.15	1.11	15	72	580	0.15
	8	1.45	7.10	3.35	3.75	0.89	15	67	588	0.15
	9	1.75	6.80	3.10	3.70	0.84	15	67	594	0.215
	11	1.35	6.55	3.35	3.20	1.05	15	-	HEMOLYSED.	-
	13	0.95	6.85	3.05	3.80	0.80	15	85	548	0.20
	15	1.10	7.90	3.20	4.70	0.68	10	90	603	0.33
	20	1.50	6.70	3.25	3.45	0.94	15	85	532	0.20
	22	1.20	8.60	3.10	5.50	0.56	20	85	496	0.25

APPENDIX 2B: HAEMATOLOGY IN FIVE CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 (UNDILUTED) AND TWO CONTROLS

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
250	-7	29	7.2	10.0	7.03	8.3	41.2	34.4	11	0	88	0	1	0	600
	-6	31	7.6	10.4	7.39	7.8	42	33.6	10	0	86	2	0	0	400
	-5	32	7.6	11.3	7.84	9.9	40.8	35.3	14	0	86	0	0	0	620
	-4	31	7.4	9.9	6.88	10.3	44.3	31.6	11	0	87	0	0	0	560
	-3	31	7.2	10.6	7.62	10.9	41.6	34	21	0	76	0	3	0	250
	-2	31	7.0	10.4	7.51	9.1	41.4	33.3	35	0	59	0	6	0	325
	-1	32	7.0	11.4	8.30	10.0	39	35.6	24	0	72	0	4	0	270
	0	36	6.8	12.4	8.28	9.6	43.5	34.2	14	0	84	0	2	0	300
	1	32	6.8	10.9	7.49	10.1	42.7	34	25	0	73	0	2	0	280
	2	32	7.2	10.9	7.03	8.4	45.7	34	9	0	90	0	1	0	310
	4	34	7.2	11.1	7.70	9.4	44.2	32.6	20	0	79	0	1	0	300
	6	33	7.0	10.9	7.16	9.9	46	33	18	0	80	0	2	0	400
	8	35	7.6	12.2	8.16	14.1	43	34.8	29	0	71	0	0	0	480
	9	32	7.0	11.0	7.63	12.7	42	34.4	47	0	53	0	0	0	500
	11	27	6.8	9.8	6.37	6.2	42.5	36.2	24	0	76	0	0	0	488
	13	23	6.4	7.8	5.74	3.1	40	34.8	20	0	80	0	0	0	490
	15	22	6.4	7.3	4.88	1.00	45	33.2	7	0	92	1	0	0	430
	17	20	5.4	6.4	4.66	1.2	43	32	3	0	97	0	0	0	300
	18	20	5.8	6.0	4.32	1.9	46	30	5	0	95	0	0	0	270

APPENDIX 2B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
251	-7	28	7.0	9.1	6.54	10.7	42.8	32.7	25	0	72	0	3	0	750
	-6	29	7.2	9.1	6.41	9.1	45.1	31.4	29	0	70	0	1	0	400
	-5	32	7.6	11.3	7.84	9.9	40.8	35.3	14	0	86	0	0	0	620
	-4	28	7.4	9.3	6.71	8.8	41.8	33.2	36	0	63	0	1	0	750
	-3	29	7.0	9.8	6.60	8.8	47	33.8	17	0	83	0	0	0	275
	-2	33	7.4	11.0	7.85	8.2	42	33.2	30	0	66	2	2	0	230
	-1	28	6.2	9.2	6.40	8.4	43.7	32.9	34	0	66	0	0	0	240
	0	32	7.0	11.1	7.64	9.4	42.5	34.5	22	0	78	0	0	0	220
	1	27	6.6	8.9	6.18	8.5	43.7	33	23	0	77	0	0	0	260
	2	28	6.2	9.5	6.20	10.5	45	34	31	0	69	0	0	0	230
	4	27	6.4	9.2	6.03	7.5	44.7	34	25	2	73	0	2	0	210
	6	28	6.4	9.1	5.96	8.8	47	32.5	30	0	68	0	2	0	360
	8	30	7.0	10.3	6.65	7.1	45	34.3	26	0	74	0	0	0	670
	9	26	6.3	8.9	5.68	7.0	45.7	34.2	30	0	70	0	0	0	700
	11	23	6.0	7.8	5.15	5.0	44.7	33.8	19	0	80	1	0	0	695
	13	22	5.8	7.1	5.18	2.4	42.5	32.2	29	0	71	0	0	0	690
	15	21	6.0	6.9	4.69	1.3	44.7	32.8	30	0	70	0	0	0	125
	17	20	5.4	6.5	4.66	1.0	43	35.5	30	0	70	0	0	0	100
	18	20	5.6	6.9	4.41	1.7	45.5	34.5	12	0	88	0	0	0	90
							45.5	31	28	0	72	0	0	0	665

APPENDIX 2B CONTINUED

ANIMAL	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
252	-7	30	7.4	10.3	6.57	8.7	45.6	34.3	14	0	85	0	1	0	500
	-6	32	7.2	10.5	6.53	8.9	48.2	32.8	28	0	70	1	1	0	470
	-5	29	7.2	10.4	7.14	8.2	40.6	35	20	0	80	0	0	0	630
	-4	29	7.1	9.6	6.25	7.1	46.5	33	19	0	81	0	0	0	670
	-3	30	7.2	10.0	7.24	10.4	41.5	32.8	21	0	79	0	0	0	282
	-2	30	7.2	9.9	6.38	9.5	47	33	21	0	73	0	0	0	400
	-1	35	7.0	12.0	7.33	10.6	47	31.8	18	0	82	0	0	0	260
	0	32	6.2	10.6	6.79	10.4	47.3	33.0	23	0	77	0	0	0	100
	1	31	6.6	9.3	5.93	9.6	57.2	30	22	0	78	0	0	0	350
	2	30	6.2	10.1	6.12	9.1	49	33.7	27	0	70	0	2	1	340
	4	31	6.8	10.4	6.68	9.3	46.3	33.5	15	1	82	2	1	0	362
	6	30	6.4	10.1	6.12	8.7	49	33.5	21	0	77	0	2	0	390
	8	37	7.6	12.8	7.76	10.5	47.6	34.7	20	0	75	0	5	0	590
	9	29	6.6	10.3	6.48	12.5	45.5	35.5	32	1	66	0	2	0	600
	11	27	6.2	9.7	5.64	6.6	48	36	22	0	78	0	0	0	590
	13	28	6.6	9.4	6.10	3.3	46	33.6	48	0	52	0	0	0	600
	15	27	6.2	9.3	5.80	0.6	46.5	34.4	52	0	48	0	0	0	162
	17	25	5.6	8.7	5.94	0.3	42.2	34.8	-	-	-	-	-	-	-
	18	27	6.2	8.9	5.72	0.4	47	32.7	2	0	98	0	0	0	200

APPENDIX 2B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm% x 10^6	HB Gm%	RBC /Cmm x 10^3	WBC /Cmm	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
253	-7	31	7.6	10.5	6.58	7.6	47.2	34.0	27	0	72	0	1	0	500
	-6	32	7.6	10.4	6.45	7.9	49.5	32.5	18	0	80	1	1	0	300
	-5	33	7.6	11.0	7.6	8.0	43.5	32.3	13	0	87	0	0	0	580
	-4	32	7.2	10.3	6.55	8.7	48.8	32.2	22	0	78	0	0	0	880
	-3	29	7.2	9.7	6.18	8.4	47	33.4	4	0	96	0	0	0	338
	-2	31	7.2	9.7	6.18	8.0	50	31.3	10	0	89	0	1	0	450
	-1	35	7.2	11.7	7.49	9.1	46	33.7	16	0	78	0	2	0	460
	0	34	7.2	11.5	7.28	9.7	47.5	33.8	14	0	86	0	0	0	440
	1	32	7.0	11.0	6.79	9.2	47	34.6	24	0	74	0	2	0	280
	2	32	6.4	10.3	6.12	8.9	52	32.2	16	0	82	0	2	0	-
	4	32	6.9	10.5	6.47	8.0	49.4	32.8	6	0	92	2	0	0	300
	6	33	7.2	11.1	6.63	7.6	49.2	33.6	7	0	90	0	3	0	280
	8	37	7.8	12.6	7.91	7.2	49.0	34	0	0	100	0	0	0	290
	9	31	7.0	10.6	6.4	7.8	48.5	34.2	18	0	82	0	0	0	330
	11	28	7.0	10	5.55	3.6	50.5	35.5	18	0	82	0	0	0	310
	13	35	7.4	11.8	7.3	1.3	48	33.8	30	0	70	0	0	0	292
	15	38	6.6	12	7.31	0.7	51.2	31.6	8	0	92	0	0	0	320

APPENDIX 2B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
258	-7	32	7.6	11.0	7.36	11.1	43.4	34.4	29	0	69	0	2	0	350
	-6	32	7.6	10.6	7.32	9.7	43.7	33.2	28	0	70	1	1	0	360
	-5	30	6.8	9.8	6.83	11.3	44	32.6	31	0	66	0	3	0	458
	-4	30	6.8	10.2	6.84	16.8	44	34	42	0	59	0	0	0	560
	-3	28	6.6	9.9	6.38	9.5	47	33	27	0	73	0	0	0	400
	-2	28	7.0	9.5	6.58	9.7	42.6	34	26	-	71	0	3	0	390
	-1	30	6.4	10.0	7.14	10.6	42	33.3	19	1	80	0	1	0	450
	0	28	6.8	9.5	6.55	9.7	42.7	34	24	0	72	1	2	1	430
	1	28	6.1	9.7	6.63	8.0	43	34.6	25	0	71	0	4	0	480
	2	31	6.6	9.5	6.34	8.1	49	30.6	21	0	74	0	5	0	460
	4	30	6.6	9.9	6.48	10.6	46.2	32.9	23	0	70	0	7	0	433
	6	32	6.8	10.3	6.92	10.6	46	32.2	26	0	69	0	5	0	760
	8	34	7.6	11.9	7.67	9.0	44.5	35	20	0	79	0	1	0	451
	9	31	7.0	10.6	7.07	9.8	44.2	34.2	24	0	72	1	3	0	480
	11	28	6.6	9.9	6.47	6.0	43.2	35.2	34	0	64	1	1	0	465

APPENDIX 2B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
B 97	-2	27	6.8	9.7	6.04	8.5	45	36	44	0	56	0	0	0	-
CONTROL	-1	27	6.4	9.2	5.47	7.6	49.2	34	29	0	70	0	1	0	475
	0	27	6.4	9.3	5.61	7.0	47	34.3	28	0	72	0	0	0	490
	1	25	7.4	8.8	5.36	7.6	46.6	35.2	39	0	61	0	0	0	550
	2	24	6.4	9.1	5.25	9.6	40.7	38	33	0	66	0	1	0	520
	4	27	6.8	9.3	5.62	7.2	48	34.4	34	0	65	0	1	0	566
	6	30	6.8	9.6	5.34	7.8	56	32	39	0	59	0	2	0	600
	8	29	6.8	10.0	5.77	7.6	50	34.4	36	0	64	0	0	0	510
	11	29	6.8	10.5	6.12	10.4	47.2	36.1	50	0	50	0	0	0	496
	13	26	6.4	8.7	5.25	8.0	49.6	33.5	36	0	64	0	0	0	509
	15	28	6.6	9.0	5.18	6.2	54	32.1	60	0	40	0	0	0	600
	17	27	6.8	9.5	5.77	9.6	47	35.2	34	4	66	0	0	0	800
	20	27	6.6	8.6	5.59	5.7	47.5	31.8	28	0	72	0	0	0	600
	22	27	5.6	9.0	5.42	7.3	50	34.5	34	0	66	0	0	0	600

APPENDIX 2B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
254 CONTROL	-2	42	7.0	13.8	10.2	17.1	42	32.8	31	0	68	1	0	0	-
	-1	43	6.8	13.4	10.2	17.6	42	31.1	24	0	75	0	1	0	393
	0	45	7.4	14.4	10.4	17.0	43.5	32.0	35	0	62	3	0	0	400
	1	45	7.2	14.9	10.16	14.8	44.3	33.1	32	0	68	0	0	0	400
	2	40	7.0	12.8	8.10	20.4	49.2	32	28	0	72	0	0	0	430
	4	45	7.4	13.5	9.3	15.4	49	30	20	0	79	0	1	0	415
	6	42	7.2	13.3	8.56	17.0	49	31.6	25	0	75	0	0	0	560
	8	47	7.9	15.6	10.63	18.3	44	33.2	32	0	68	0	0	0	163
	9	43	7.2	13.9	10.14	17.9	42.2	32.4	28	0	72	0	0	0	210
	11	47	7.4	16.1	10.93	18.6	43	34.3	29	0	71	0	0	0	200
	13	45	7.2	13.7	9.97	16.9	45.3	30.3	27	0	73	0	0	0	240
	15	42	6.8	13.6	9.25	16.5	45.5	32.4	27	1	73	0	0	0	400
	17	44	7.4	14.1	10.45	16.4	42	32	29	1	70	0	0	1	340
	20	43	7.0	14.0	9.54	15.4	44.5	32.7	33	0	67	0	0	0	200

APPENDIX 2B NO. 258 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
258	13	27	6.6	9.3	6.5	3.7	41.7	34.4	16	0	84	0	0	0	470
	15	24	5.8	8.3	5.64	1.6	42.6	34.6	10	0	90	0	0	0	860
	17	24	5.0	8.0	5.44	1.4	44	33.4	25	0	75	0	0	0	760
	18	24	5.4	8.1	5.46	1.6	44	34.7	27	0	73	0	0	0	810
	20	21	4.8	7.4	4.88	1.1	43	35.2	23	0	77	0	0	0	720
	22	19	4.8	6.0	4.07	0.9	47.5	31.6							

APPENDIX 3:

THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED I:IO.

BIOCHEMISTRY AND HAEMATOLOGY.

APPENDIX 3 A - BIOCHEMISTRY IN FIVE INFECTED AND TWO CONTROL CALVES -THEILERIA PARVA(MUGUGA) STABILATE 44 DILUTED 1 : 10

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
254	-5	2.11	6.80	3.10	3.70	0.84	10	69	468	-
	-4	2.95	7.25	3.60	3.65	0.99	13	100	544	0.20
	-3	2.88	7.05	3.10	3.95	0.78	10	67	512	0.20
	-2	2.48	6.80	3.80	3.00	1.27	25	72	632	0.20
	-1	1.98	6.73	2.87	3.86	0.74	15	75	468	0.50
	0	1.90	6.65	2.42	4.23	0.57	15	85	480	0.20
	1	2.00	6.73	2.85	3.88	0.73	10	75	484	0.10
	2	0.90	6.73	3.60	3.13	1.15	20	75	504	0.15
	3	1.35	7.80	3.25	4.55	0.71	15	78	492	0.25
	5	1.10	6.73	2.85	3.88	0.73	∠10	92	412	0.10
	7	1.10	6.15	2.00	4.15	0.48	∠10	90	404	0.25
	9	1.10	6.35	3.15	3.20	0.99	∠10	100	300	0.20
	10	0.90	6.24	3.30	2.94	1.12	∠10	87	412	0.30
	12	0.90	6.15	2.95	3.20	0.93	∠10	100	308	0.24
	14	1.05	5.75	2.50	3.25	0.77	15	162	704	0.45
	16	0.60	6.60	2.85	3.75	0.76	∠10	672	1024	-
	17	0.60	5.75	2.70	3.05	0.89	13	606	1104	2.05
	19	0.65	5.60	2.70	2.90	0.93	13	690	1528	1.90
	21	0.85	5.65	2.65	3.00	0.88	17	270	1652	4.19
	23	4.80	5.70	2.10	3.60	0.58		600	816	-

APPENDIX 3 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
255	-5	3.28	6.40	3.04	3.36	0.90	10	87	576	-
	-4	3.35	6.45	3.10	3.35	0.93	10	100	704	0.15
	-3	2.30	6.15	2.95	3.20	0.92	15	92	424	0.11
	-2	2.45	6.60	2.95	3.65	0.81	20	75	712	0.20
	-1	2.50	6.38	2.90	3.48	0.83	10	82	604	0.19
	0	2.10	6.38	2.25	4.13	0.54	10	87	604	0.13
	1	1.90	6.08	2.82	3.26	0.87	8	95	600	0.10
	2	1.40	6.38	3.14	3.24	0.97	10	92	576	0.10
	3	1.36	6.20	3.05	3.15	0.97	13	79.5	632	0.25
	5	1.05	6.58	2.95	3.63	0.81	10	113	512	0.15
	7	1.00	6.30	2.15	4.15	0.52	10	110	496	0.24
	9	1.00	6.10	3.15	2.95	1.07	10	110	364	0.18
	10	1.05	6.20	2.95	3.25	0.91	10	99	412	0.24
	12	2.95	6.40	3.10	3.30	0.94	10	104	552	0.21
	14	1.20	6.30	2.85	3.45	0.83	15	160	616	0.40
	16	0.75	6.45	2.60	3.85	0.68	10	252	628	0.40
	17	0.65	5.70	3.05	2.65	0.15	10	180	604	0.20
	19	0.60	6.00	2.95	3.05	0.97	10	96	696	0.20
	21	2.50	6.15	2.80	3.35	0.84	10	192	644	0.30
	23	0.70	5.80	2,60	3.20	0.81	10	76	516	0.40
	27	1.95	6.30	3.10	3.20	0.97	10	60	676	0.30
	29	1.10	5.75	2.60	3.15	0.83	10	60	436	0.21
	31	1.20	6.80	3.20	3.60	0.89	10	90	532	0.05
	35	2.40	6.25	2.79	3.46	0.81	15	140	664	-

APPENDIX 3 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
257	-5	2.60	5.92	2.80	3.12	0.90	15	63	468	-
	-4	3.05	7.10	3.20	3.90	0.82	20	95	596	0.10
	-3	2.06	6.60	3.28	3.32	0.99	17	72	544	0.25
	-2	2.48	6.80	3.80	3.00	1.27	25	72	632	0.20
	-1	1.95	7.10	2.85	4.15	0.69	15	76	496	0.065
	0	2.05	6.02	2.25	3.77	0.60	20	82	488	0.12
	1	1.90	6.38	2.85	3.53	0.81	16	95	552	0.11
	2	1.00	6.65	3.35	3.30	1.02	25	77	584	0.23
	3	1.20	6.38	3.10	3.28	0.95	20	78	552	0.30
	5	0.90	6.25	2.70	3.55	0.76	<10	116	464	0.125
	7	1.00	6.58	2.45	4.13	0.59	<10	102.5	448	0.22
	9	0.85	5.80	2.90	2.90	1.00	15	92	296	0.22
	10	0.85	6.00	3.10	2.90	1.07	10	73	396	0.28
	12	1.00	6.62	2.85	3.77	0.76	10	93	416	0.21
	14	0.90	5.50	2.55	2.95	0.86	20	40	220	0.40
	16	2.10	5.65	2.20	3.45	0.64	10	138	456	0.40
	17	0.60	5.50	2.40	3.10	0.71	15	240	712	0.55
	19	0.60	5.60	2.70	2.07	1.30	15	444	1360	0.33
	21	0.60	5.65	2.95	2.70	1.09	15	1000	1652	2.03

APPENDIX 3 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
278	-5	4.20	7.10	3.00	4.10	0.73	12	103	568	-
	-4	4.65	7.42	3.30	4.12	0.80	15	101	684	0.20
	-3	3.42	7.10	3.20	3.90	0.82	20	103	676	0.15
	-2	4.40	6.45	2.63	3.82	0.69	15	75	676	0.20
	-1	3.06	6.38	2.70	3.68	0.73	12	104	612	0.20
	0	2.95	6.85	2.05	4.80	0.43	18	-	740	0.160
	1	2.92	6.73	2.85	3.88	0.73	20	120	652	0.23
	2	1.70	6.73	2.85	3.88	0.73	15	112	684	0.35
	3	3.50	6.55	2.90	3.65	0.79	10	106	616	0.40
	5	1.90	6.58	2.80	3.78	0.74	∠10	131	556	0.09
	7	1.75	6.60	2.15	4.45	0.48	∠10	102.5	428	0.20
	9	2.64	6.45	3.20	3.25	0.98	10	94	492	0.170
	10	3.45	6.24	2.80	3.44	0.81	∠10	101	388	0.20
	12	1.90	6.15	2.95	3.20	0.92	10	93	468	0.15
	14	2.65	6.50	2.50	4.00	0.63	20	118	612	0.30
	16	1.75	6.40	2.10	4.30	0.49	15	110	536	0.20
	18	1.10	5.20	2.30	2.90	0.79	13	110	464	0.20
	20	1.35	5.40	2.45	2.95	0.83	∠10	168	552	0.20
	22	0.65	5.80	2.25	3.55	0.63	15	110	588	0.10
	24	1.05	5.30	2.60	2.70	0.96	10	115	328	0.74
	27	1.10	5.80	2.65	3.15	0.84	10	90	616	0.11
	29	1.445	5.60	2.50	3.10	0.81	18	100	620	0.22
	31	1.15	6.30	2.86	3.45	0.83	10	190	596	-
	35	1.50	6.00	2.50	3.50	0.71	18	140	620	-

APPENDIX 3 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
279	-5	6.00	6.80	2.55	4.25	0.600	10	69	468	-
	-4	6.25	6.45	2.65	3.80	0.700	20	90	596	0.10
	-3	4.40	7.18	2.95	4.23	0.700	12	70	696	0.10
	-2	5.02	7.10	2.40	4.70	0.51	15	47	668	0.20
	-1	3.60	6.73	2.25	4.48	0.500	10	71.50	540	0.15
	0	3.60	6.95	1.70	5.25	0.32	10	72.0	568	0.20
	1	3.90	6.38	2.85	3.53	0.81	10	80	708	0.20
	2	2.65	7.05	3.35	3.70	0.91	10	80	684	0.10
	3	2.80	6.79	2.40	4.39	0.55	15	72	728	0.15
	5	1.35	6.78	2.40	4.38	0.55	10	90	536	0.16
	7	1.90	6.80	1.81	4.99	0.36	10	95	400	0.15
	9	2.00	6.81	2.60	4.21	0.62	10	96	484	0.18

APPENDIX 3 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
279 (CONT).	10	2.25	6.55	3.05	3.60	0.85	10	87	428	0.18
	12	2.00	7.05	2.85	4.20	0.68	10	89	488	0.15
	14	3.20	7.25	3.10	4.15	0.75	15	55	480	0.35
	16	1.80	6.65	2.95	3.70	0.80	15	98	580	0.40
	17	1.60	5.60	2.40	3.20	0.75	10	110	660	0.49
	19	1.55	5.50	2.40	3.10	0.77	15	234	736	0.43
	21	1.10	5.65	2.10	3.55	0.59	10	180	744	0.60
	23	1.15	5.85	4.25	1.60	2.66	10	119	352	0.18
	27	1.70	6.50	4.40	2.10	2.10	10	68	608	0.35
	29	2.00	6.30	4.80	1.50	3.20	15	120	752	0.50
	31	1.80	7.10	2.80	4.30	0.65	10	100	568	-
	35	1.78	6.90	2.30	4.60	0.50	15	80	552	-

APPENDIX 3A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
No. 272	-5	3.08	6.07	2.80	3.27	0.86	10	56	560	-
CONTROL.	-4	4.15	6.80	3.30	3.50	0.94	15	100	712	0.15
	-3	3.05	7.42	3.65	3.77	0.97	15	87	684	0.10
	-2	3.10	5.80	2.70	3.10	0.87	15	100	656	0.20
	-1	2.35	5.48	2.48	3.00	0.83	∠10	105	720	0.10
	0	2.40	6.08	1.90	4.18	0.45	15	105	640	0.09
	1	2.40	6.43	2.55	3.88	0.66	10	117	680	0.10
	2	2.05	6.35	2.75	3.60	0.77	∠10	110	772	0.10
	3	2.40	5.55	2.85	2.70	1.55	∠10	101	732	0.31
	5	3.30	6.40	2.45	3.95	0.62	∠10	108	512	0.17
	7	4.00	6.58	2.15	4.43	0.49	∠10	108.5	580	0.24
	9	2.10	6.46	2.85	3.61	0.79	10	120	592	0.24
	10	2.00	6.00	3.10	2.90	1.70	∠10	110	496	0.30
	12	2.40	6.40	2.62	3.78	0.69	∠10	115	532	0.15
	14	4.90	6.25	2.55	3.70	0.69	∠10	113	632	0.20
	16	2.40	6.80	3.00	3.80	0.79	15	98	612	0.30
	17	2.00	6.05	2.70	3.35	0.81	∠10	90	712	0.17
	19	2.35	5.95	3.25	2.70	1.20	15	120	456	0.25
	21	2.20	6.00	2.40	3.60	0.67	∠10	90	590	0.20
	23	3.20	5.80	3.35	2.55	1.32	∠10	100	380	0.25
	27	2.10	5.80	2.60	3.20	0.81	∠10	71	808	0.28
	29	2.50	6.05	3.10	2.95	1.10	∠10	80	436	0.35

APPENDIX 3A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
274	-5	4.22	6.55	3.20	3.35	0.96	10	92	524	-
CONTROL.	-4	4.15	6.85	3.30	3.55	0.93	10	100	612	-
	-3	2.80	6.60	3.20	3.40	0.94	15	82	560	0.22
	-2	3.27	6.30	3.04	3.26	0.93	15	77	576	0.20
	-1	3.30	6.55	2.87	3.68	0.73	12	84	560	0.20
	0	3.05	6.55	2.15	4.40	0.49	15	92	504	0.11
	1	3.05	6.15	3.05	3.85	0.79	15	100	536	0.20
	2	2.05	6.90	3.20	3.70	0.86	10	105	544	0.17
	3	3.45	5.97	3.10	2.87	1.08	15	86	512	0.35
	5	2.00	6.78	2.95	3.83	0.77	10	120	580	0.17
	7	2.00	6.95	2.45	4.50	0.54	10	110	404	0.20
	9	2.05	7.00	3.30	3.70	0.89	10	104	444	0.28
	10	2.10	6.40	3.30	3.10	1.06	10	94	-	0.20
	12	3.05	6.65	2.95	3.70	0.80	10	73	400	0.17
	14	2.55	6.55	2.95	3.60	0.82	10	97	404	0.10
	16	2.25	7.60	2.45	5.15	0.48	10	73	496	0.25
	17	2.35	6.40	3.25	3.15	1.03	10	110	412	0.20
	19	2.75	5.80	2.65	3.15	0.84	10	156	720	0.20
	21	2.30	6.45	3.05	3.40	0.90	10	94	456	0.26
	23	2.90	5.85	3.80	2.05	1.85	10	108	348	0.07
	27	1.95	6.45	3.15	3.30	0.95	10	70	528	0.28
	29	3.65	5.80	2.50	3.30	0.76	10	200	732	0.10
	31	2.80	6.60	3.32	3.28	1.01	10	70	684	-

APPENDIX 3B: HAEMATOLOGY IN FIVE CALVES INFECTED WITH THEILERIA PARVA (MUGUGA) STABILATE 44 DILUTED 1:10 AND TWO CONTROLS

ANIMAL	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
254	-4	42	7.2	12.7	8.66	10.5	48.5	30.2	19	0	80	0	0	1	950
	-3	43	7.4	13.8	8.16	14.3	52.7	32	22	0	78	0	0	0	500
	-2	40	6.5	13.7	7.49	12.8	53.4	34.2	30	0	70	0	0	0	530
	-1	39	6.8	12.9	9.12	14.2	42.7	33.1	29	1	71	0	0	0	490
	0	39	7.0	13.0	8.93	13.6	43.6	33.3	30	1	70	0	0	0	500
	1	41	6.4	12.8	9.76	14.1	42	31.2	37	0	61	0	2	0	550
	2	40	6.3	13.6	9.22	13.7	43.4	34	29	0	71	0	0	0	550
	3	40	6.6	13.1	10.14	13.1	39.4	32.7	25	0	74	0	1	0	500
	5	36	6.4	12.2	9.12	14.8	39.5	33.6	19	1	80	0	1	0	480
	7	36	6.0	11.8	9.07	13.6	39.7	32.8	23	0	77	0	0	0	-
	9	35	6.6	11.2	7.49	10.0	46.7	32.0	28	0	72	0	0	0	500
	10	34	6.4	11.4	8.44	8.2	40.3	33.5	18	0	82	0	0	0	520
	12	33	6.3	10.5	7.50	5.6	44	32	20	0	80	0	0	0	520
	14	31	5.6	10.7	10.21	4.9	30.3	34.5	27	0	72	0	1	0	490

EXPERIMENT 3B NO. 254 CONTINUED

ANIMAL	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
254	16	30	8.0	9.6	8.44	1.8	35.6	32.0	25	0	75	0	0	0	500
	17	28	8.0	9.70	6.59	1.8	42.5	34.6	26	0	74	0	0	0	570
	19	26	6.2	8.3	7.67	1.7	33.9	31.9	30	0	70	0	0	0	600
	21	24	6.2	7.2	5.77	1.08	41.6	30	12	0	88	0	0	0	220
	22	25	5.4	7.9	6.06	2.7	41.2	36.2	19	1	81	0	0	0	-
255	-4	44	6.4	13.9	8.99	7.5	49.7	31.6	14	0	86	0	0	0	640
	-3	40	6.6	13.5	8.56	8.7	47	33.7	11	0	89	0	0	0	540
	-2	44	6.8	14.6	9.54	9.3	46.2	33.1	20	1	80	0	0	0	520
	-1	38	6.6	12.3	8.51	9	44.6	32.4	19	0	81	0	0	0	600
	0	38	6.4	12.2	8.21	9	46.3	32.1	19	1	80	0	1	0	580
	1	37	5.8	11.9	8.00	8.7	46.3	32.1	25	0	74	0	1	0	600
	2	40	5.8	12.6	8.56	7.1	46.7	31.5	24	0	76	0	0	0	560
	3	37	6.1	11.4	8.08	6.7	45.8	30.8	11	0	89	0	0	0	530
	5	37	6.2	10.9	7.36	6	50	29.4	14	0	86	0	0	0	522
	7	36	5.8	11.4	7.63	8.7	45.2	31.7	12	0	88	0	0	0	-

EXPERIMENT 3B NO. 255 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
255	9	36	6.4	11.7	8.03	5.8	44.8	32.7	24	0	74	1	1	0	540
	10	37	6.2	12.2	7.93	6.1	46.6	32.9	17	0	83	0	0	0	-
	12	37	6.8	12.0	8.51	4.1	43.5	32.5	24	0	74	1	1	0	570
	14	33	5.8	10.9	10.60	4.3	31.2	33.0	22	1	78	0	0	0	600
	16	33	8.2	10.2	8.80	5.5	37.5	30.9	20	1	80	0	0	0	425
	17	30	8.0	10.10	7.22	5.65	41.5	33.7	9	0	90	0	1	0	500
	19	30	6.2	10.2	7.27	9.75	41.3	34.0	7	0	93	0	0	0	458
	21	30	6.2	8.8	6.57	7.6	45.6	29.3	7	0	93	0	0	0	480
	23	27	6.0	9.1	6.85	8.3	39.4	33.6	15	0	85	0	0	0	460
	26	26	6.2	9.7	6.94	11.1	37.5	37.3	20	0	78	2	0	0	-
	28	26	6.2	8.6	6.65	7.8	39.1	33	9	1	89	1	1	0	201
	30	28	6.6	9.0	6.32	8.7	44.3	31.1	18	1	80	0	2	0	220
	35	26	6.0	8.1	6.12	7.2	42.5	31.1	10	0	90	0	0	0	200

APPENDIX 3B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
257	-4	40	6.0	12.7	9.03	12.2	44.5	31.7	26	0	69	0	5	0	480
	-3	43	6.6	14.4	9.29	12.9	46	33.4	22	0	72	0	6	0	740
	-2	43	6.8	14.4	9.12	11.9	47.2	33.5	28	1	67	1	4	0	700
	-1	37	6.0	12.1	8.74	10.8	42.4	32.7	24	0	74	0	2	0	680
	0	38	6.0	12.6	7.47	11.5	50.8	32.2	38	3	60	1	1	0	700
	1	39	5.8	12.5	8.55	11.9	45.5	32	35	2	61	0	4	0	670
	2	41	5.9	12.3	9.07	10.9	45.2	30	28	0	70	0	2	0	620
	3	38	6.2	12.3	8.65	10.8	43.9	32.4	25	0	73	0	2	0	640
	5	35	5.8	12.1	8.03	10.75	43.5	34.6	16	0	84	0	0	0	660
	7	35	5.2	11.2	8.16	9.3	43	32	13	0	87	0	0	0	-
	9	33	5.5	10.5	7.47	8.1	44.2	31.8	14	0	84	0	1	0	700
	10	32	5.6	10.7	6.59	9.3	48.5	33.4	3	0	97	0	0	0	-
	12	29	5.6	9.8	6.00	7.6	48	33.7	12	0	88	0	0	0	682
	14	27	5.2	8.5	8.48	11.8	32.8	31.5	21	6	75	3	1	0	590

APPENDIX 3B NO. 257 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
257	16	27	7.0	8.8	7.23	8.7	37.3	32.6	19	0	81	0	0	0	680
	17	30	6.5	9.8	6.96	4.3	43.1	32.6	19	1	81	0	0	0	720
	19	27	5.8	9.0	6.91	1.6	39.1	33.3	12	0	88	0	0	0	650
	21	29	5.8	8.6	6.68	1.5	43.4	29.6	11	0	89	0	0	0	160
278	-4	35	7.0	12.1	8.17	9	43	33.8	17	0	82	0	1	0	385
	-3	35	7.4	12.3	8.21	10.5	42.6	35.1	21	0	76	0	3	0	600
	-2	36	6.8	11.7	7.76	8.5	46.3	32.5	17	0	79	0	4	0	650
	-1	33	6.8	11.2	8.17	9.8	40.4	33.9	23	0	75	0	2	0	640
	0	33	6.6	11.3	7.44	9.9	44.3	34.2	25	0	72	1	2	0	660
	1	34	6.5	11.4	7.68	9.4	44.3	33.5	34	2	62	1	3	0	520
	2	33	5.8	11.1	7.65	9	43.1	33.6	30	0	70	0	0	0	700
	3	33	6.2	10.7	7.58	8.4	43.5	32.4	22	0	75	0	3	0	720
	5	36	6.2	9.4	6.35	7.4	56.5	26.1	18	0	82	0	0	0	698
	7	31	6.0	9.8	7.20	9.5	43	31.6	40	0	60	0	0	0	-
	9	29	6.4	9.2	6.54	7.8	44.3	31.7	25	0	75	0	0	0	701

APPENDIX 3B NO. 278 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
278	10	31	6.4	11.5	8.08	9.6	38.4	37.1	33	0	67	0	0	0	-
	12	30	6.4	11.1	7.36	9.2	40.7	37.0	44	0	56	0	0	0	678
	14	29	5.6	9.3	9.18	6.7	30.6	32.0	35	1	64	0	1	0	490
	16	26	7.8	8.7	6.35	5.8	40.9	33.4	32	0	68	0	0	0	175
	17	23	5.0	8.0	6.12	4.5	37.6	34.8	14	0	86	0	0	0	235
	19	26	5.4	7.7	5.75	7.6	45.3	29.6	9	0	91	0	0	0	250
	21	25	5.2	6.7	5.30	6.8	47.1	26.8	15	0	85	0	0	0	490
	23	24	5.6	7.6	5.70	8.2	42.1	31.6	32	0	66	0	2	0	150
	26	22	5.8	8.3	5.90	12.5	37.3	37.7	42	0	55	3	0	0	-
	28	22	6.0	7.4	5.76	12.2	38.2	33.6	32	1	63	5	0	0	200
	30	22	6.2	7.5	5.31	11.1	41.4	34	33	0	67	0	0	0	300
	34	20	5.8	6.6	5.08	7.3	40	33	35	3	65	0	0	0	285

APPENDIX 3B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
279	-4	32	6.8	11.1	6.94	10.8	46	34.7	20	0	75	1	4	0	500
	-3	33	7.2	11.4	7.67	11.4	42.8	34.5	11	0	89	0	0	0	480
	-2	30	6.8	10.6	6.47	11.8	46.3	35.3	28	2	68	1	3	0	580
	-1	30	6.8	10.0	6.93	14.7	43.3	33.3	29	1	70	0	1	0	480
	0	31	6.8	10.2	6.53	15	47.5	33	30	0	68	0	2	0	550
	1	31	6.4	10.4	6.78	17.8	45.7	33.5	33	0	66	0	1	0	490
	2	31	6.2	9.7	6.94	13.8	44.7	31.3	28	0	70	0	2	0	610
	3	31	7.0	10.3	6.81	14.8	45.5	33.2	39	2	61	0	0	0	600
	5	31	6.7	10.4	6.59	14.5	47	33.6	29	0	70	0	1	0	640
	7	28	5.8	8.2	5.74	13.4	48.7	29.3	29	0	71	0	0	0	-
	9	29	6.6	9.2	6.20	11.7	46.7	31.7	30	0	70	0	0	0	670
	10	29	6.6	10.1	7.49	16.2	38.8	34.8	27	0	71	0	2	0	-
	12	33	7.24	11.1	7.64	10	43.2	33.5	30	0	70	0	0	0	700

APPENDIX 3B NO. 279 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^6
279	14	27	6.2	8.6	7.81	8.0	34.6	31.8	33	0	67	0	0	0	550
	16	23	8.2	6.1	4.46	5.0	51.5	32.1	27	0	73	0	0	0	400
	17	19	5.6	5.50	4.02	4.2	47.2	28.8	20	0	80	0	0	0	472
	19	17	6.1	4.7	3.41	6.8	49.7	27.6	23	0	77	0	0	0	510
	21	13	7.6	4.1	2.96	10.6	44.0	31.5	28	0	72	0	0	0	200
	23	15	5.4	4.4	2.57	8.7	58.3	29.3	37	1	63	0	0	0	200
	26	18	6.4	5.8	2.77	13.8	65.0	32.2	15	0	85	0	0	0	-
	28	17	6.4	4.8	2.50	8.6	68.0	28.2	10	0	88	2	0	0	210
	30	19	6.6	5.8	2.56	13.1	74.2	32.1	24	0	73	3	0	0	249
	34	23	6.5	6.9	3.29	10.6	69.6	30	25	0	74	0	1	0	260

APPENDIX 4:

THEILERIA PARVA (KIAMBU) STABILATE 32 INFECTION.

BIOCHEMISTRY AND HAEMATOLOGY.

APPENDIX 4A - BIOCHEMISTRY IN FIVE INFECTED AND TWO CONTROL CALVES - THEILERIA PARVA (KIAMBU) STABILATE 32

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
W.27	-2	1.57	6.00	2.95	3.05	0.97	13	122	379	0.19
	-1	1.20	7.10	3.40	3.70	0.92	15	108	399	0.50
	0	1.25	6.60	3.20	3.40	0.94	15	134	573	0.43
	1	2.20	6.05	3.08	2.17	1.42	18	121	474	0.25
	2	2.40	6.10	2.90	3.20	0.91	20	96	735	0.18
	3	1.95	5.85	2.80	3.05	0.92	13	108	456	0.20
	4	3.30	6.25	2.95	3.30	0.89	10	98	697	0.18
	6	2.80	6.70	3.10	3.60	0.86	10	89	542	0.10
	8	4.00	6.85	3.05	3.80	0.80	15	100	975	0.04
	10	3.50	6.55	2.85	3.70	0.77	∠10	80	518	0.13
	13	3.50	6.40	2.65	3.75	0.71	15	86	665	0.40
	15	2.00	4.80	2.55	2.25	1.13	18	190	607	0.33
	16	1.30	5.90	2.40	3.50	0.69	25	172	480	-
	18	0.85	4.90	2.05	2.85	0.72	20	260	733	0.75
	20	1.20	4.30	2.05	2.25	0.91	25	260	1012	1.63
	22	1.35	4.20	1.80	2.40	0.75	50	280	936	2.12

APPENDIX 4A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
L.22	-2	5.00	6.60	3.00	3.60	0.83	15	123	389	0.15
	-1	0.95	7.00	3.10	3.90	0.79	15	92	371	0.25
	0	1.20	6.40	2.70	3.70	0.73	18	94	450	0.22
	1	1.45	6.15	2.65	3.50	0.76	15	128	412	0.23
	2	2.00	6.28	2.75	3.53	0.78	18	120	494	0.30
	3	1.20	6.20	2.50	3.70	0.68	10	126	527	0.24
	4	2.05	6.48	2.48	4.00	0.62	10	120	531	0.16
	6	1.90	7.25	2.48	4.77	0.52	15	103	753	0.11
	8	2.20	6.35	2.70	3.65	0.74	15	136	524	0.18
	10	1.75	6.40	2.45	3.95	0.62	20	94	488	0.35
	13	2.60	6.45	2.15	4.30	0.50	20	94	463	0.20
	15	1.20	6.30	2.65	3.65	0.73	15	91	447	0.83
	16	0.90	6.45	2.35	4.10	0.57	20	184	408	-
	18	1.65	6.00	2.10	3.90	0.54	18	258	724	0.90
	20	1.30	5.75	2.05	3.60	0.57	20	226	724	0.65
	22	1.10	5.70	2.00	3.70	0.54	25	220	788	-
	24	0.70	5.70	2.45	3.25	0.75	15	190	680	0.53
	25	0.95	5.60	2.28	3.32	0.69	10	202	790	0.32
	27	0.65	5.25	2.05	3.30	0.62	20	174	754	0.58

APPENDIX 4A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
L.22	30	1.70	5.65	2.05	3.60	0.57	20	168	772	0.42
(CONT).	32	2.45	5.80	1.98	3.82	0.52	13	154	900	0.21
	34	2.20	4.87	1.75	3.12	0.56	15	147	-	0.25
	36	2.20	6.10	2.45	3.55	0.69	15	147	-	0.21
	38	4.80	6.25	2.25	4.00	0.56	18	228	-	0.12
	42	1.65	6.30	1.95	4.35	0.45	20	98	-	0.10
L. 25	-2	2.55	5.85	2.95	2.90	1.00	15	122	557	0.24
	-1	0.15	9.00	4.65	4.35	1.00	25	70	634	0.31
	0	0.90	6.40	3.20	3.20	1.00	18	88	569	0.30
	1	2.10	5.80	2.95	2.85	1.04	15	108	593	0.25
	2	3.80	5.90	2.88	3.02	0.95	15	110	652	0.27
	3	2.10	6.25	2.95	3.30	0.89	18	82	553	0.20
	4	2.60	6.55	3.10	3.45	0.90	15	70	553	0.23
	6	1.65	6.95	2.95	4.00	0.74	15	94	826	0.23
	8	2.10	6.55	2.95	3.60	0.82	20	78	615	0.40
	10	2.65	6.60	3.00	3.60	0.83	15	70	625	0.30
	13	3.15	6.60	2.80	3.80	0.74	15	77	620	0.24
	15	2.10	6.55	2.75	3.80	0.72	18	86	668	0.27
	16	1.80	6.75	2.85	3.90	0.73	25	79	570	-

APPENDIX 4 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
L.25(CONT).	18	1.65	6.00	2.70	3.30	0.82	18	107	656	0.25
	20	1.40	5.90	2.60	3.30	0.79	18	96	756	0.20
	22	1.75	6.15	2.80	3.35	0.84	15	101	696	0.20
	24	3.10	7.35	3.25	4.10	0.79	10	132	645	0.32
	25	1.45	6.60	3.90	3.70	0.78	13	86	652	0.24
	27	1.15	6.45	2.85	3.60	0.79	13	67	723	0.15
	30	1.40	6.05	2.65	3.40	0.78	13	67	615	0.500
	32	2.10	5.75	2.60	3.15	0.83	10	76	615	0.22
	34	2.30	3.35	2.20	3.15	0.70	10	72	-	0.17
	36	2.25	6.30	3.10	3.20	0.97	10	77	-	0.23
	38	1.40	6.30	2.80	3.50	0.80	10	68	-	0.08
	42	2.15	6.40	2.55	3.85	0.66	15	55	-	0.07
W. 25	-2	2.65	6.80	3.65	3.15	1.20	10	164	542	0.30
	-1	2.05	7.90	3.90	4.00	0.98	13	119	-	0.60
	0	2.20	6.70	3.25	3.45	0.94	15	100	580	0.21
	1	1.45	6.00	3.15	2.85	1.11	15	103	607	0.33

APPENDIX 4A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
W.25 (CONT).	2	4.05	6.55	3.00	3.55	0.85	10	86	473	0.31
	3	3.15	6.55	2.95	3.60	0.82	15	100	440	0.25
	4	1.50	6.95	3.20	3.75	0.85	15	70	642	0.27
	6	2.90	7.20	3.20	4.00	0.80	10	103	736	0.28
	8	3.30	6.60	3.00	3.60	0.83	15	118	-	0.30
	10	3.95	6.55	3.00	3.55	0.85	15	100	606	0.25
	13	3.90	6.60	2.80	3.80	0.74	10	115	660	0.18
	15	3.00	6.60	2.65	3.95	0.67	15	126	837	0.20
	16	3.100	6.50	2.85	3.65	0.78	25	136	637	-
	18	2.80	5.65	2.60	3.05	0.85	10	167	735	0.28
	20	2.75	5.75	2.60	3.15	0.83	10	147	826	0.25
	22	3.10	6.45	2.90	3.55	0.82	10	137	880	0.20
	24	1.70	7.30	3.40	3.90	0.87	15	110	698	0.26
	25	3.30	6.30	2.80	3.50	0.80	15	121	658	0.22
	27	1.70	6.30	2.80	3.50	0.80	15	126	587	0.10
	30	2.45	5.80	2.40	3.40	0.71	10	96	542	-

APPENDIX 4 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
W.25 (CONT).	32	3.50	6.25	2.70	3.55	0.76	13	125	735	0.28
	34	3.70	5.35	2.40	2.95	0.81	10	126	-	0.25
	36	2.82	5.80	2.85	2.95	0.97	10	126	-	0.13
	38	2.90	5.80	2.20	3.60	0.61	10	112	-	0.10
	42	3.35	6.05	2.40	3.65	0.66	10	102	-	0.15
NO. 280	-2	3.15	6.25	3.00	3.25	0.92	15	123	512	0.18
	-1	0.50	7.03	3.70	3.33	1.10	13	52	528	0.32
	0	1.40	5.75	2.85	2.90	0.98	20	120	592	0.27
	1	2.45	5.50	2.75	2.75	1.00	15	125	703	0.25
	2	3.80	5.50	2.25	3.25	0.69	15	100	553	0.23
	3	2.30	5.45	2.65	2.80	0.95	15	120	508	0.20
	4	2.50	6.25	2.80	3.45	0.81	10	113	697	0.20
	6	2.50	6.30	2.95	3.35	0.88	10	110	735	0.13
	8	3.10	6.25	2.80	3.45	0.81	18	125	645	0.20
	10	2.60	6.55	2.75	3.80	0.72	10	99	610	0.40
	13	3.95	6.25	2.55	3.70	0.69	15	96	712	0.40
	15	3.60	6.55	2.55	4.00	0.64	13	100	673	0.25
	16	3.60	6.00	2.65	3.35	0.79	15	139	583	-

APPENDIX 4 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
NO. 280(CONT).	18	3.50	6.00	2.60	3.40	0.76	10	129	802	0.35
	20	3.30	5.45	2.40	3.05	0.79	<10	123	795	0.35
	22	3.30	6.45	2.85	3.60	0.79	10	106	864	0.20
	24	3.55	6.80	2.95	3.85	0.77	15	96	648	0.26
	25	3.10	6.00	2.80	3.20	0.88	17	95	573	0.16
	27	2.45	6.05	2.80	3.25	0.86	20	96	533	0.15
	30	3.00	5.45	2.43	3.02	0.80	10	101	588	0.30
	32	3.80	5.80	2.50	3.30	0.76	15	112	615	0.30
	34	3.70	4.87	2.00	2.87	0.70	10	100	-	0.180
	36	3.75	6.15	3.20	2.95	1.08	10	116	-	0.14
	38	3.30	5.90	2.75	3.15	0.87	10	128	-	0.12
	42	3.40	6.75	2.35	4.40	0.53	<10	94	-	0.15

APPENDIX 4 A(CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
L.23	-2	2.95	6.60	3.95	3.01	1.20	15	114	435	0.21
CONTROL.	-1	1.40	8.00	4.00	4.00	1.00	20	106	396	0.30
	0	1.80	6.05	2.95	3.05	0.97	20	94	492	0.21
	1	3.60	5.65	3.05	2.60	1.17	20	115	461	0.30
	2	4.10	6.24	2.88	2.36	0.86	15	110	523	0.34
	3	2.55	6.10	3.05	3.05	1.00	15	96	493	0.67
	4	3.00	5.95	2.85	3.10	0.92	15	100	480	0.64
	6	3.00	6.40	2.95	3.45	0.86	15	108	716	0.19
	8	3.85	6.05	2.65	3.40	0.78	10	118	635	0.27
	10	2.85	5.90	2.75	3.15	0.87	25	108	517	0.30
	13	3.45	6.45	2.45	4.00	0.61	15	101	520	0.25
	15	2.10	6.25	2.60	3.65	0.71	20	94	621	0.20
	16	1.90	6.05	2.55	3.50	0.73	17	85	403	-
	18	2.30	5.65	2.50	3.15	0.79	15	125	480	0.45
	20	2.35	5.30	2.25	3.05	0.74	10	89	525	0.30
	22	2.80	6.00	2.65	3.35	0.79	15	91	730	0.30
	24	1.80	6.30	2.90	3.40	0.85	10	116	643	0.5

APPENDIX 4 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
L.23	25	2.25	6.25	2.60	3.65	0.71	10	116	772	0.32
CONTROL.	27	2.05	6.00	2.65	3.35	0.79	15	101	515	0.35
(CONT).	30	2.70	5.80	2.40	3.40	0.71	15	96	715	0.42
	32	3.10	5.90	2.25	3.65	0.62	10	94	578	0.25
	34	3.05	5.00	2.15	2.85	0.75	15	82	-	0.23
	36	2.35	5.80	2.85	2.95	0.97	10	86		0.23
	38	3.10	6.20	2.85	3.35	0.85	15	100		0.04
	42	3.10	6.25	2.42	3.83	0.63	10	78		0.05
273	-2	4.50	7.12	4.20	2.88	1.46	18	104	676	0.28
CONTROL.	-1	1.80	9.65	5.45	4.20	1.29	10	74	554	0.38
	0	3.80	5.75	2.95	2.80	1.05	20	90	658	0.37
	1	3.80	6.00	3.22	2.72	1.18	18	94	731	0.53
	2	3.85	5.55	2.95	2.60	1.13	10	84	692	0.28
	3	4.80	5.25	2.75	2.50	1.10	10	118	439	0.22
	4	4.55	6.48	2.95	3.53	0.84	10	125	897	0.32
	6	4.90	5.95	2.85	3.10	0.92	10	110	891	0.20
	8	5.60	5.65	2.95	3.70	0.80	10	114	765	0.28
	10	5.20	6.00	2.80	3.20	0.88	20	90	670	0.30
	13	4.80	6.15	2.70	3.45	0.78	10	106	800	0.29
	15	4.40	6.25	2.70	3.55	0.76	10	113	824	0.35

APPENDIX 4 A (CONT).

ANIMAL NO.	DAY	A.P. SIG.	T.P. Gm%	A. Gm%	G. Gm%	A/G. RATIO	BUN. Mg%	SGOT. S.F.	LDH. W.U.	T.B. Mg%
273	16	3.60	6.00	2.65	3.35	0.79	-	106	583	-
CONTROL.	18	3.00	5.50	2.65	2.85	0.93	20	101	628	0.95
(CONT).	20	3.60	5.65	2.88	2.77	1.04	10	116	762	0.40
	22	3.00	5.90	2.80	3.10	0.09	10	91	832	0.40
	24	2.70	6.05	2.95	3.10	0.96	10	96	670	0.32
	25	2.75	7.35	2.90	4.45	0.65	10	86	590	0.20
	27	2.75	7.35	2.95	4.40	0.67	10	91	735	0.30
	30	3.80	5.40	2.65	2.75	0.96	13	101	787	0.40
	32	4.05	5.46	2.85	2.61	1.09	10	98	725	0.31
	34	4.00	4.45	2.20	2.25	0.98	10	110		0.20
	36	3.45	5.69	3.10	2.59	1.20	10	136		0.20
	38	4.80	6.15	3.45	2.70	1.28	10	128		0.17
	42	3.40	6.75	2.35	4.40	0.53	10	94		0.15

APPENDIX 4B - HAEMATOLOGY IN CALVES
INFECTED WITH THEILERIA PARVA (KIAMBU).

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
L 22	-2	29	6.4	9.2	6.03	13.8	48	31.5	41	3	57	1	1	0	-
	-1	33	6.6	10.4	7.05	18.4	47	31.5	54	0	46	0	0	0	550
	0	31	6.4	9.3	6.30	17.5	49.3	30	56	0	44	0	0	0	630
	1	31	6.4	9.4	6.42	16.3	48.2	30.3	45	0	54	0	1	0	760
	2	33	7.0	10.9	7.67	15.7	43	33	37	1	63	0	0	0	600
	3	30	6.4	9.4	6.47	13.7	46.2	31.2	32	0	68	0	0	0	550
	4	30	6.2	10.0	6.45	14.3	46.5	33.4	39	0	61	0	0	0	600
	6	33	6.4	9.7	6.35	12.4	52	29.4	19	0	79	2	0	0	710
	8	35	6.6	11.3	8.47	19.1	41.3	32.2	58	0	39	1	2	0	650
	10	32	6.9	10.3	7.3	12.3	43.8	32.2	29	0	71	0	0	0	675
	13	35	6.4	10.7	7.02	18.0	49.8	30.6	74	2	26	0	0	0	650
	15	29	6.8	8.7	6.08	7.3	48.2	30	52	0	48	0	0	0	600

APPENDIX 4B NO. L22 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
L 22	16	27	6.7	8.5	6.01	6.0	45	31.5	49	3	49	2	0	0	360
	18	27	6.5	8.9	5.54	8.8	48.7	33	47	0	53	0	0	0	400
	20	24	6.0	7.5	5.46	3.2	44	31.3	20	3	79	1	0	0	400
	22	23	5.6	7.4	5.24	4.1	42.2	32.1	14	0	84	2	0	0	350
	24	22	6.0	6.8	5.36	5.70	41	31	28	0	72	0	0	0	330
	25	21	5.4	6.6	3.59	4.8	58.5	31.5	27	0	72	0	1	0	360
	27	23	5.6	6.7	4.60	8.6	50	29	40	0	60	0	0	0	360
	30	24	5.9	7.7	4.56	15.4	52.2	32	56	0	44	0	0	0	300
	32	25	6.2	7.9	4.94	17.0	50.5	31.6	62	0	37	1	0	0	150
	34	24	6.4	7.9	4.83	8.7	49.7	32.9	54	1	40	0	0	0	550
	36	25	6.0	7.9	5.50	8.6	45.5	31.6	52	0	48	0	0	0	410
	38	26	6.4	8.2	5.75	12.7	45.3	31.5	56	0	44	0	0	0	370
	42	29	6.1	8.9	5.94	8.4	48.7	30.7	51	0	49	0	0	0	430

APPENDIX 4B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
L 25	-2	35	6.4	11.4	7.90	9.3	32.6	32.5	28	0	69	0	1	2	-
	-1	31	5.8	9.4	6.84	8.4	45.3	31.9	28	0	70	0	1	1	405
	0	30	6.0	9.9	6.99	9.9	43.0	32.8	16	0	78	0	0	6	394
	1	31	6.0	9.8	6.87	9.7	45	31.6	22	0	78	0	0	0	490
	2	30	6.0	9.9	6.59	10.3	45.5	30.3	24	0	76	0	0	0	510
	3	30	6.4	9.6	7.07	12.9	43	32	46	0	52	0	2	0	569
	4	29	5.8	9.6	6.69	11.2	43.4	33	16	0	83	0	1	0	320
	6	28	6.0	9.3	6.51	9.5	43	33.2	14	0	84	1	1	0	750
	8	29	6.4	9.7	6.74	9.6	43	33.4	20	0	80	0	0	0	610
	10	28	6.2	8.7	5.96	9.3	47	31	15	0	85	0	0	0	570
	13	29	6.4	9.6	6.54	8.1	44.3	33	48	0	50	0	2	0	550
	15	27	6.4	8.9	6.15	5.4	44	33	17	0	83	0	0	0	520
	16	26	6.4	9.0	6.25	9.0	41.7	34.6	19	0	80	0	1	0	460
	18	28	6.2	8.9	6.22	8.5	45	31.7	13	0	87	0	0	0	500
	20	26	6.3	8.8	6.54	7.3	40.3	33.8	11	0	89	0	0	0	600

APPENDIX 4B NO. L25 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
L 25	22	25	6.2	8.8	6.10	7.0	41	35	18	0	82	0	0	0	560
	24	28	7.2	9.9	6.98	11.2	40	35	24	0	76	0	0	0	540
	25	29	6.6	10.0	6.54	13.2	44.5	34.5	23	0	77	0	0	0	600
	27	25	6.0	8.3	6.14	3.1	40.8	33.2	30	0	70	0	0	0	550
	30	27	6.6	8.1	5.37	8.3	50	30	21	0	78	0	0	1	600
	32	26	6.6	8.8	5.64	7.6	46	33.8	22	0	78	0	0	0	555
	34	28	7.0	9.4	5.96	8.6	46	33.5	26	0	74	0	0	0	460
	36	27	6.6	9.1	6.53	10.0	41.5	33.6	29	0	71	0	0	0	348
	38	27	6.4	9.1	6.59	9.2	41	33.7	38	0	62	0	0	0	565
	42	29	6.3	9.6	6.61	10.3	43.8	33.1	47	0	53	0	0	0	690

APPENDIX 4B CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
W 25	-2	35	6.7	11.5	7.63	9.4	32.8	33.0	14	0	84	1	1	0	-
	-1	37	6.6	11.2	7.55	6.7	47.8	31.2	21	0	78	1	1	0	500
	0	36	6.5	10.5	7.05	9.6	45.8	32.7	29	2	68	0	2	1	454
	1	31	6.4	10.0	6.60	8.3	47	32.2	30	0	67	0	3	0	690
	2	32	6.6	10.3	7.23	8.4	44.1	32.1	36	0	64	0	0	0	500
	3	30	5.8	9.7	6.61	11.6	45.5	32.3	24	2	75	0	1	0	530
	4	29	6.4	9.8	6.76	8.0	43	33.8	20	0	80	0	0	0	400
	6	31	6.5	10.2	6.98	8.3	44.5	33	22	0	76	0	2	0	690
	8	31	6.4	9.4	6.80	7.8	45.7	30.3	38	0	62	0	0	0	700
	10	31	6.4	9.7	6.45	7.0	48	31.3	31	0	63	0	6	0	425
	13	30	6.4	9.7	6.71	4.3	44.7	32.3	26	0	74	0	0	0	620
	15	31	6.2	9.7	6.65	3.7	46.5	31.3	43	0	57	0	0	0	470
	16	30	6.4	10.0	6.52	4.7	46	33.3	15	0	82	1	2	0	600
	18	28	5.8	8.8	5.70	2.8	49.2	31.4	12	0	88	0	0	0	550
	20	28	5.8	8.5	5.90	4.4	47.5	30.4	11	0	89	0	0	0	760

APPENDIX 4B NO. W25 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
W 25	22	27	6.4	8.8	6.34	6.6	42.6	32.3	18	0	82	0	0	0	450
	24	32	7.6	11.0	7.97	7.7	40	34.3	28	0	72	0	0	0	560
	25	27	6.6	8.7	5.94	7.5	45.5	32.3	30	0	70	0	0	0	520
	27	25	6.0	8.0	5.77	7.9	43.3	32.2	29	0	71	0	0	0	450
	30	24	6.0	7.4	4.89	7.5	49.2	30.6	30	0	70	0	0	0	400
	32	30	7.0	9.6	6.14	8.3	48.8	32.0	26	0	74	0	0	0	655
	34	30	6.8	9.9	6.19	9.7	48.5	33	32	0	68	0	0	0	500
	36	28	6.2	9.6	6.17	6.2	45.5	34.4	42	0	58	0	0	0	350
	38	27	6.4	8.7	6.51	7.8	41.5	32.2	43	0	56	0	1	0	470
	42	28	6.4	9.4	6.41	8.2	43.7	33.6	45	0	55	0	0	0	390
W 27	-2	39	6.3	12.5	8.58	9.7	32	35.7	38	0	50	2	2	2	-
	-1	40	6.6	12.5	8.55	7.6	46.8	31.3	31	0	69	0	0	0	230
	0	34	6.2	11.3	7.79	8.5	43.8	33.1	46	0	54	0	0	0	260
	1	34	6.0	10.5	7.33	9.9	46.3	31	34	0	66	0	0	0	380

APPENDIX 4B NO. W27 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
W 27	2	35	6.0	10.6	7.55	9.9	46.1	30.3	40	0	60	0	0	0	452
	3	32	5.6	10.4	7.42	13.7	43.1	32.4	55	0	44	0	1	0	490
	4	33	5.8	10.1	7.14	12.2	46.2	30.7	55	0	45	0	0	0	350
	6	34	5.8	11.0	7.72	11.9	44.2	32.4	46	0	54	0	0	0	700
	8	36	6.4	11.5	8.10	11.4	44.5	32	38	0	61	1	0	0	620
	10	33	6.0	11.1	7.12	11.5	46.5	33.6	47	0	52	0	1	0	580
	13	31	6.0	9.8	6.94	4.4	44.7	31.6	57	0	42	1	0	0	560
	15	28	5.6	9.2	6.23	3.0	45	32.8	30	0	70	0	0	0	600
	16	27	5.6	9.1	6.32	2.3	42.7	33.7	20	0	80	0	0	0	510
	18	29	4.6	8.7	6.27	0.8	46.2	30	29	0	70	1	0	0	570
	20	28	4.8	8.2	5.91	0.9	47.5	29.3	27	0	73	0	0	0	390
	22	29	4.4	9.2	6.39	1.3	45.5	31.7	12	0	88	0	0	0	150
280	-2	37	6.0	12.0	7.90	12.10	27.4	32.5	34	3	54	2	11	0	-
	-1	34	5.8	11.0	7.42	9.9	45.8	32.2	25	2	69	0	6	0	600
	0	31	5.4	10.1	6.91	12.4	45	32.7	49	0	46	0	5	0	560
							49	31	42	0	54	0	4	0	430

APPENDIX 4B NO. 280 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
280	3	30	5.6	9.3	6.32	12.7	47.5	31	40	0	56	0	4	0	500
	4	29	5.3	8.8	5.76	11.9	50.5	30.3	35	0	61	0	4	0	750
	6	30	5.8	9.8	6.67	12.1	45	32.6	43	0	53	0	4	0	750
	8	33	6.2	10.8	7.36	11.90	44.7	32.7	41	0	54	0	5	0	770
	10	34	6.2	11.1	7.43	14.3	46.0	32.6	38	0	56	0	6	0	670
	13	29	6.0	9.9	6.38	12.1	45.5	34.1	36	0	60	0	3	1	650
	15	32	6.4	9.8	6.31	11.8	50.6	30.6	23	0	74	0	3	0	610
	16	31	6.4	10.4	7.04	13.6	44	33.6	31	2	67	1	1	0	600
	18	30	6.0	9.6	6.78	12.6	44.5	32	24	0	76	0	0	0	590
	20	28	5.6	8.3	6.13	9.5	45.5	29.6	32	0	68	0	0	0	630
	22	30	6.6	10.3	6.96	11.90	43.2	34.3	42	0	58	0	0	0	750
	24	31	6.5	10.6	7.10	12.7	43.5	34.2	33	0	67	0	0	0	800
	25	30	6.0	9.7	5.94	11.0	50.5	32.2	33	0	66	0	1	0	595
	27	28	5.8	7.8	5.38	9.5	52	28	31	0	69	0	0	0	750
	30	29	6.0	9.3	5.6	12.9	51.5	32	24	0	76	0	0	0	600

APPENDIX 4B NO. 280 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
280	32	30	6.6	11.0	6.77	13.8	44.3	36.7	49	0	50	0	1	0	450
	34	31	6.2	9.9	5.96	11.8	52	31.9	25	0	73	0	2	0	490
	36	29	6.0	10.1	6.60	12.6	41.7	35	29	0	71	0	0	0	600
	38	30	6.2	9.7	6.46	17.6	46.5	32.3	66	0	29	0	5	0	425
	42	28	6.4	9.1	5.89	9.3	47.7	32.7	34	0	55	0	11	0	320

APPENDIX 4B CONTINUED NO. L23 CONTROL

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
L 23	-2	32	6.0	9.8	7.23	8.9	44.4	30.5	28	0	72	0	0	0	-
	-1	31	6.0	9.5	6.87	8.3	45.2	30.6	16	0	84	0	0	0	400
	0	29	5.6	9.6	7.14	9.1	41.2	33	28	0	70	1	0	1	510
	1	30	5.8	9.5	6.94	10.5	43.2	31.7	29	0	70	0	1	0	510
	2	31	6.0	10.4	7.49	11.6	41.3	33.5	27	0	73	0	0	0	625
	3	31	5.6	10.2	7.84	11.3	40	32.9	24	0	72	4	0	0	590
	4	29	5.4	9.6	6.92	10.9	42	33	30	0	69	1	0	0	450
	6	31	5.8	9.7	7.36	10.3	42	31.2	22	0	78	0	0	0	580
	8	30	6.8	9.9	7.26	10.5	41.5	33	5	0	95	0	0	0	408
	10	31	5.8	10.1	7.15	9.5	43.3	32.6	15	0	84	1	0	0	370
	13	29	6.1	9.4	7.07	8.3	41.0	32.4	27	0	73	0	0	0	500
	15	28	5.4	9.2	6.74	8.7	41.5	32.8	8	0	92	0	0	0	450
	16	29	5.8	9.6	6.79	8.8	42.7	33	27	0	73	0	0	0	520
	18	28	5.8	8.9	5.9	10.0	47.5	31.7	28	0	71	1	0	0	560
	20	26	5.6	8.5	6.36	8.6	41	32.7	13	0	87	0	0	0	600
	22	27	6.2	9.1	6.53	7.8	41.5	33.6	7	0	92	0	1	0	750
	24	27	6.2	9.5	6.75	9.6	40	35.2	16	0	84	0	0	0	600

APPENDIX 4B NO. L23 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
L 23	25	26	6.6	8.8	6.83	8.6	38	33.7	20	0	80	0	0	0	635
	27	25	5.8	8.1	6.31	7.5	40	32.4	15	0	84	0	1	0	600
	30	26	5.8	7.9	5.55	8.8	47	30.3	15	0	85	0	0	0	550
	32	27	6.2	8.7	5.60	8.8	48	32.2	15	0	85	0	0	0	600
	34	27	6.1	8.5	5.52	8.5	49	31.5	14	0	86	0	0	0	580
	36	27	6.0	8.7	6.53	9.8	41.5	32.2	15	0	84	0	1	0	600
	38	26	6.4	8.8	6.63	7.7	39.2	33.8	21	0	77	1	1	0	490
	42	29	6.2	9.8	6.91	10.9	42	33.8	27	0	73	0	0	0	650
273	-2	39	6.0	13.0	8.88	7.0	32.2	33.4	17	0	82	0	1	0	-
CONTROL	-1	36	6.0	12.3	7.64	6.40	47.2	34.2	22	0	78	0	0	0	750
	0	35	5.6	11.9	7.88	6.30	44.5	33.9	15	0	84	0	1	0	660
	1	35	6.0	11.3	7.48	6.70	47	32.3	20	0	80	0	0	0	800
	2	35	6.0	12.1	7.95	7.9	44	34.6	24	0	76	0	0	0	450
	3	35	5.4	12.0	7.75	8.6	46.2	34.3	31	0	69	0	0	0	450

APPENDIX 4B NO. 273 CONTINUED

ANIMAL NO.	DAY	PCV %	TP Gm%	HB Gm%	RBC /Cmm x 10^6	WBC /Cmm x 10^3	MCV	MCHC	TN %	ST %	L %	M %	E %	B %	PLATELETS /Cmm x 10^3
273	6	33	5.4	10.9	7.71	6.8	42.8	33	32	0	68	0	0	0	650
	8	33	5.8	10.8	7.08	6.8	47	32.7	29	0	71	0	0	0	670
	10	35	5.8	11.2	7.33	7.7	47.5	32.0	32	0	68	0	0	0	520
	13	33	5.6	10.9	7.84	5.6	42.0	33.0	24	0	74	1	1	0	600
	15	33	5.8	10.9	7.35	6.6	45	33	13	0	87	0	0	0	580
	16	39	7.0	13.3	8.79	16.0	44.5	34	48	3	52	0	0	0	700
	18	35	6.0	10.7	6.66	7.3	52.5	30.7	26	0	74	0	0	0	650
	20	33	6.2	10.8	6.48	7.3	51	32.7	19	0	80	0	1	0	450
	22	34	6.4	11.9	7.62	6.8	44.6	35	21	0	79	0	0	0	550
	24	33	5.8	11.0	7.87	7.3	42	33.2	30	0	69	1	0	0	210
	25	34	6.0	10.2	6.96	6.6	49.0	30	29	0	70	1	0	0	300
	27	32	5.6	10.6	7.24	8.1	44.7	33	40	0	60	0	0	0	250
	30	32	5.8	10.3	6.52	8.9	49	32.1	35	0	65	0	0	0	200
	32	33	5.6	11.1	6.58	8.1	50	33.6	32	0	68	0	0	0	400
	34	33	5.8	10.4	6.59	6.5	50	31.5	8	0	91	1	0	0	410
	36	32	5.4	10.8	7.15	7.9	44.7	33.7	14	0	86	0	0	0	500
	38	33	6.2	11.2	7.99	7.2	41.3	34	15	0	85	0	0	0	625

APPENDIX 5:

RESPIRATORY RATE, PULSE RATE AND RIGHT PRESCAPULAR LYMPH NODE MEASUREMENTS IN THREE CALVES (L25, W25, 280) INFECTED WITH THEILERIA PARVA (KIAMBU) STABILATE 32.

APPENDIX 5:

RESPIRATORY RATES (R.R.), PULSE RATES (P.R.) AND RIGHT PRESCAPULAR GLAND (RPG) MEASUREMENTS IN 3 CALVES RECOVERING FROM THEILERIA PARVA (Kiambu) STABILATE 32 INFECTION

DAYS	CALF L 25			CALF W 25			CALF 280		
	R.R. /min	P.R. /min	RPG Cm.	R.R. /min	P.R. /min	RPG Cm.	R.R. /min	P.R. /min	RPG Cm.
0	16	76	1.2	20	72	1.2	16	76	2.2
1	16	64	1.4	16	68	1.2	20	76	2.2
2	16	68	1.2	20	68	1.4	16	76	2.2
3	16	80	1.2	24	76	1.2	20	76	2.2
4	24	68	1.2	16	68	1.2	20	72	2.2
5	20	60	1.2	16	60	1.2	20	60	2.2
6	24	64	1.2	20	68	1.4	16	60	2.2
7	18	60	1.2	20	60	1.2	20	60	2.2
8	16	72	1.2	16	64	1.2	20	56	2.2
9	20	64	1.2	24	64	1.2	24	56	2.2
10	20	64	1.3	24	64	1.2	24	50	2.2
11	18	60	1.2	20	60	1.2	20	56	2.0
12	20	64	1.2	20	60	1.4	20	52	2.2
13	16	68	1.2	16	72	1.8	20	64	2.2
14	20	90	1.4	24	80	1.8	20	72	2.0
15	24	72	1.2	20	64	1.8	20	64	2.2
16	20	70	1.6	20	60	1.6	24	68	2.2
17	20	80	1.8	20	88	2.8	16	68	2.0
18	20	84	1.5	16	80	2.2	20	64	2.1
19	20	80	1.6	16	80	1.8	20	60	2.2
20	20	84	1.2	20	76	1.8	20	76	2.0
21	20	80	1.2	20	68	1.4	20	70	2.2
22	20	72	1.2	16	68	1.4	16	72	2.3
23	18	76	1.2	18	70	1.6	16	68	2.2
24	20	80	1.2	20	76	1.4	16	64	2.2

APPENDIX 5 CONTINUED

DAYS	CALF L 25			CALF W 25			CALF 280		
	R.R. /min	P.R. /min	RPG Cm.	R.R. /min	P.R. /min	RPG Cm.	R.R. /min	P.R. /min	RPG Cm.
25	28	76	1.3	20	76	1.8	20	64	2.0
26	20	70	1.2	16	70	1.4	16	62	2.0
27	20	80	1.3	16	64	1.4	16	68	2.2
28	28	76	1.2	24	80	1.3	16	72	2.2
29	20	72	1.2	20	80	1.4	18	64	2.2
30	18	76	1.2	24	76	1.4	20	64	2.0