It should be noted that non-pregnant sheep which were starved but did not show any clinical signs of domsiekte exhibited this diminution of splenic lymphoid tissue to a degree equal to the actual cases. This phenomenon cannot, therefore, be looked upon as pathognomonic for Domsiekte, but merely as a result of starvation and possibly a contributory factor to the causation of the disease.

The Lymph Glands.

The diminution of lymphopoietic activity already noted in the spleen, was also reflected in the lymph nodes. As stated before these organs were greatly diminished in size. On section the trabeculae appeared to be very numerous and prominent, an appearance caused by the reduction of the lymphatic elements. The cortex was in some cases entirely homogeneous, consisting merely of small lymphocytes, with no vestige of germ centres to be found. In others there were small open spaces, corresponding in position to germ centres. In these spaces the strauma was very clear owing to the almost entire absence of cells, there being an occasional large lymphocyte present. These usually numbered less than ten in any one centre, in thin sections. Mytotic figures were not seen.

This lack of activity of lymphoid tissue in the glands, as in the spleen, occurred in starved animals whether they developed Domsiekte or not.

The decrease of lymphopoietic activity in the spleen and glands, must, of course, be considered together. The reason for the marked drop in blood lymphocytes is then explained.

The Brain.

No visible lesions were discovered in the brain either macroscopically or microscopically. The microscopical study was, however, only carried out on Helle's and Formalin fixed material under the routine stains. It is admitted that more detailed cytological studies are necessary before any definite statement can be made.

The Thyroid.

No changes were found on microscopic examination of sections of the thyroid.

The Epiphysis and Hypophysis.

Similarly no lesions could be demonstrated in these organs.

The Adrenals.

As previously stated a marked fatty degeneration of the adrenal cortex was noticed on macroscopical examination.

In order to get an idea of the amount of Sudan staining fat normally present in the adrenal cortex of sheep, sections were prepared from material taken from normal sheep slaughtered on the station for rations. These sheep were non-pregnant. It was seen that there was very little Sudan-staining fat present. In the case of the pregnant control sheep slaughtered there was a fine sprinkling of evenly sized small red droplets but it was noticeable that the outer zone (i.e. that portion that would correspond to the Zona Glomerulosa of man or Zona arcuata of other animals) contained very little fat, if any.

The picture in cases of Domsiekte was entirely different, especially in the pregnant sheep. Here the large irregularly sized fat droplets were encountered in the majority of the cells. The fat was so prevalent that macroscopically

Sudan 3 stained sections showed a blue counterstained medulla surrounded by a bright orange or red cortex. It was noticeable that the outer zone described above was as markedly, and even, in some instances, more affected than the rest of the cortex. Phagocytosis of large fat droplets by swollen endothelial cells was observed. The gross accumulation of fat, often in droplets large enough as to almost fill the cell, the irregular size of the droplets, and in less extreme cases the uneven distribution of the fat, together with this phenomenon of endothelial phagocytosis of fat, leave no doubt as to the pathological nature of these changes.

In the case of the non-pregnant animal which showed clinical symptoms these changes were not marked. The two non-pregnant sheep that were starved but did not develop any symptoms showed a slight accumulation of fat especially in the outer zone. It would, therefore, appear that the adrenal cortex of pregnant sheep is far more susceptible to this change than that of non-pregnant ewes. In view of the known intimate connection of the adrenal cortex with pregnancy as well as with carbohydrate metabolism, this may be a most significant fact. The gross changes seen in the case of pregnant sheep might well be explained by postulating a higher susceptibility due to the greater functional activity and may well give an important pointer to the reason for the higher susceptibility of pregnant animals.

No changes were observed in the adrenal medulla.

Summary.

The following histopathological findings have been made in undoubted cases of domsiekte, but all have also been found in sheep that were starved but showed no symptoms. No specific lesion or group of lesions can therefore be given for the histopathological diagnosis of domsiekte. It must be remembered, however, that the clinical manifestations of the disease are probably simply the result of a summation of the metabolic and morphological changes already known above the tolerance level of the particular animal. In other words the disease is the result of a physiological tendency exceeding the normal limits to become pathological, sometimes subclinically, sometimes fatally. If this conception is accepted it must follow that, especially under South African conditions, the reported cases of visible domsiekte must represent only a small percentage of the subclinical outbreaks.

The following are changes noted:—

1. Fatty infiltration of the liver.
2. Fatty degeneration of the proximal convoluted tubule of the kidney and nephrosis.
3. Fatty degeneration of the adrenal cortex.
4. Slight fatty degeneration of the myocardium.
5. Atrophy of lymphoid tissue both of the lymph glands and in the Malpighian bodies of the spleen.
6. Lymphocytopaenia probably associated with the foregoing.
7. Neutrophilia, the causation or function of which has not been determined.
8. Fat necrosis especially of the fat in the abdominal cavity.

Discussion of Possible Significance of Morphological Changes.

Fatty Infiltration of the Liver.

If one accepts the hypothesis of a carbohydrate deficiency being the initial cause of Domsiekte this lesion can easily be understood. As the store of available carbohydrate becomes low fat is brought to the liver from the depots for combustion. Owing to the carbohydrate lack this fat cannot be utilised and remains cluttering up the liver cells.

It is, however, very difficult to appraise the actual rôle of the fatty liver in the pathogenicity of the disease. It is well known that fat is stored and found in the liver in physiological conditions, more especially in the latter stage of pregnancy (M'Fadyean). Whether the fat actually represents a morbid condition or not, therefore, becomes a matter of opinion as to its amount. The further fact that there is no visible reaction to, or damage by, the fat, also makes one hesitate to look upon this lesion as purely pathological. The nuclei appear normal even in the most grossly affected livers. The absence of any icterus clinically and of bile stasis microscopically, proves that these fat-laden hepatic cells are still capable of performing some of their functions normally. There is, of course, no reason to suppose that other less visible metabolic functions of the liver are not interfered with, indeed it would be most surprising if they were not. Furthermore when one has seen the gross fatty condition of these livers, resembling butter in colour, feel and consistency, as well as the enormous accumulations of fat under the microscope, it cannot be denied that this condition has passed well over the border of the physiological.

It is felt, however, that, probably owing to its obviousness at post-mortem, too much stress has been laid on this fatty infiltration of the liver to the detriment of the study of other organs. Even if this be the primary and most important lesion, the gross imbalance of metabolism must react on other systems and the study of their changes would lead to a better understanding of the mechanism of the disease.

The Kidneys.

Although fatty degeneration of the renal epithelium has been mentioned in the literature, no great significance has been attributed to the condition and it is not considered to be constantly present. One is, therefore, somewhat hesitant in assessing the rôle of this lesion. The renal changes in the present series were so constant and so striking, however, that it would appear that this aspect has been greatly understressed. When we consider the great significance attached to renal changes in the literature on human eclampsia and pregnancy toxaemias, one is greatly emboldened to lay greater stress on the kidney pathology in relation to domsiekte than has been done heretofore.

The absolutely constant site of the fatty changes in the renal tubule and the severity of the nephrosis leave no doubt in the observer's mind as to the relevancy of these changes to the condition of starvation. They, appear, therefore, to play an important rôle in the syndrome of domsiekte.

Although it is admitted that the final elucidation of Domsiekte will probably come more from the biochemist's test tube than the pathologists's microscope, it must be assumed that all morbid conditions have their own morphological aspect, although our technique may not always demonstrate it. If one were looking for the most probable cause of death in domsiekte from a morphological viewpoint, these gross renal changes would be the first to enter one's mind.

Biochemical studies on the urine towards the termination of the disease, would of course be essential in this connection.

It is frequently stated in the literature that this renal change is secondary, the result of the disease and not the cause of it. This will readily be admitted, but the fact does not affect the importance of the lesion in the chain of events leading to death. If it is assumed that the disease is primarily one of metabolism, leading to abnormal metabolites being produced, then these substances must have their effect on certain organs and systems, leading to damage and further functional disturbances. These " secondary " changes may in turn cause further damage and further complications, so that the true conception of the condition would be a summation of metabolic and morphological changes, each reacting on the other, to the final typical disease. Looked at in this light the obvious damage to so vital an organ as the kidney would be of the greatest possible significance.

The Atrophy of Lymphatic Tissue.

It is exceedingly difficult to assess the significance of this change as so little appears to be known of the function of the lymphocytes. Carlström *et al.* state, however, that acetonaemia is most easily produced in ruminants and least easily in horses, with man occupying an intermediary position. The enormous amounts of acid formed in the rumen may easily predispose these animals to an acidosis, and the preponderence of lymphocytes may be connected with this aspect of metabolism. It must be clearly stated that this is pure conjecture, but this reduction of lymphatic tissue is a most intriguing change and its study may well elucidate certain aspects of the function of the lymphocyte.

The theory that lymphatic tissue is associated with cell nutrition must also be taken into consideration.

The Endocrines.

All the known endocrines were examined macroscopically and microscopically under the usual routine stains (H.E.-V.G. and S.3), but it is not claimed that a detailed examination of these organs was carried out. The cytological study of each endocrine would be a work in itself and even after exhaustive examination the absence of demonstrable cytological changes does not preclude the absence of functional disturbances. Such a gross and extensive derangement of functions of the body, must be reflected in that key to all functional regulation, the endocrine system. The absence of mammary development before parturition noted in literature on domsiekte also points to endocrine disturbance.

As stated above the cortex of the adrenal showed undoubted degenerative changes. The importance of this organ in connection with both pregnancy and general metabolism makes this observation of the highest significance.

Fat Necrosis.

Although very little appears to be known of the chemistry and mechanism of fat necrosis, its appearance in a disease known to centre on the question of fat metabolism appears highly significant.

Acknowledgments.

The author wishes to thank Miss G. E. Laurence for the preperation of the camera lucida sketches.

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SECTION D.—THE BLOOD PICTURE IN DOMSIEKTE.

(CONTRIBUTED BY R. CLARK.)

As the sheep were bled for the purpose of chemical analysis, the opportunity was taken to obtain samples for studying the cellular elements. The blood was centrifuged and total leucocyte and differential counts were taken.

THE ERYTHROCYTE PRECIPITATE.

It is of interest to note that no demonstrable variation in the red cell precipitate was noted, even after periods of starvation up to 50 days. This corresponds with the chemical analysis for haemoglobin.

No anaemic changes were seen during microscopic examination of smears.

THE PLASMA.

The plasma was in all cases clear and unpigmented.

No icterus was noted clinically in any of the cases and it is of interest that, despite the gross fatty infiltration of the livers seen at post-mortem, these liver cells were apparently still able to perform their function as regards the bile pigments and to keep the plasma clear of pigment.

In view of the extensive changes seen in the body in connection with fat metabolism it is also surprising that in all cases the plasma was free of any visible fat. This is also corroborated, and more fully discussed, in the section dealing with the chemical analysis of the blood.

THE LEUCOCYTES.

The blood of sheep suffering from domsiekte was found to have an increased percentage of neutrophiles and a decreased percentage of lymphocytes. An increase in the total neutrophiles per c.mm. and a decrease in total lymphocytes was also demonstrated. No definite change in the total leucocyte count was shown.

As stated above, these blood studies were done on samples obtained when the sheep were bled for chemical analysis. Unfortunately, owing to technical difficulties in dealing with the sudden rush of samples in the chemical laboratories, is was found impossible to bleed the sheep in strict rotation according to experimental groups. Consequently when it was later attempted to analyse the results

of the blood counts it was found impossible to use the original groups as laid down in the experimental plan. On this account a statistical analysis on the basis of averages was found to be very difficult. For the purpose of a preliminary analysis the figures were divided into four groups.

1. Figures from non-pregnant sheep prior to the ration being cut, i.e. on a full diet.
2. Figures from pregnant sheep prior to the ration being cut.
3. Figures from sheep after the ration had been cut but before symptoms had appeared.
4. Figures from all sheep showing domsiekte. The results are laid out in Table 6.

Comparison of Figures from Pregnant and Non-Pregnant Sheep on a Full Ration.

It will be seen from Table 6 that there was no difference between the figures in these two groups except a slightly higher coefficient of variation for the pregnant group. These figures also correspond to those accepted as normal. The pregnant group were all bled in the 5th month of gestation.

The Effect of Starvation Prior to the Appearance of Symptoms.

This group was included in order to see whether any change could be demonstrated to be due to starvation alone and unassociated with the disease. As will be seen the figures correspond to the normal but this cannot be taken as proof that the starvation had no effect on the blood picture for the following reasons:—

1. Many of the figures are from sheep which had only been starved for a day or two and therefore could not be reasonably expected to show any changes.
2. Owing to the fact that the pregnant sheep showed symptoms very soon after the cut in the ration, the bulk of these figures are from non-pregnant sheep which did not show any changes for a long period.
3. The change in the blood picture will be shown later to occur at very nearly the same time as the appearance of symptoms.

It is, of course, impossible to dissociate the effects of starvation from those of domsiekte as the one is apparently the effect of the other.

The changes in the blood after the cut in the ration will be discussed later.

The Figures from Sheep showing Domsiekte.

It will be seen from Table 6 that there was a marked change in the blood picture in sheep suffering from domsiekte. The total leucocytes per c.mm. did not alter appreciably on the average, but the percentage neutrophiles rose to 70·9 and that of the lymphocytes dropped to 26·6. There was also a marked rise in the actual total neutrophiles and a drop in total lymphocytes per c.mm. The differences between the figures and those for the other groups were tested statistically and found significant ($p = 0 \cdot 001$). There is therefore a rise in the number of neutrophiles and a drop in the number of lymphocytes in the blood of sheep suffering from domsiekte.

TABLE 6.

GROUP.	Number of Counts.	LEUCOCYTES.			NEUTROPHILES.				LYMPHOCYTES.			
		Average Total per c.mm.	Standard Deviation.	Coefficient of Variation.	Average Total per c.mm.	Per Cent. of Total.	Standard Deviation.	Coefficient of Variation.	Average Total per c.mm.	Per Cent. of Total.	Standard Deviation.	Coefficient of Variation.
				Per Cent.				Per Cent.				Per Cent.
Pre-starvation; non-pregnant.....	9	5300	± 332	18·82	2297	43·3	± 352	45·94	2771	52·3	± 286	30·90
Pre-starvation; pregnant.....	24	5000	± 294	28·86	2193	43·9	± 273	53·94	2645	52·9	± 233	40·17
Starvation; no disease	42	5000	± 257	33·4	2062	41·2	± 213	66·89	2689	51·8	± 155	37·4
Starvation; disease..	53	6200	± 409	48·07	4397	70·9	± 396	65·53	1648	26·6	± 79	34·73

There is, of course, the possibility that the rise in neutrophiles was due to a concurrent bacterial infection but there is no evidence in support of this explanation. The figures for pregnant ewes were only used prior to lambing or abortion so that the metritis encountered in some cases after these events would not affect the counts. There were some cases of enteritis among the starved sheep, but this did not appear to effect the neutrophile count and in any case would not affect the interpretation of the figures as it was most common among the non-pregnant group (i.e. the bulk of the " starved-no disease " group) as these were on the starvation diet for a longer period. Furthermore none of the sheep showed any purulent process at post-mortem except for the cases of metritis and enteritis mentioned. The absence of a high leucocyte count would also militate against the assumption that the high neutrophile count was of bacterial origin.

The Relation Between Neutrophiles and Lymphocytes to the Total Leucocytes.

The preponderence of neutrophiles would naturally give this factor the predominant rôle in the causation of fluctuations in the total leucocytes. This aspect is illustrated in Table 7 and Graph 4.

Table 7.

Group.	N.	Correlation Coefficient Neutrophiles to Total Leucocytes.	P. Value.	Correlation Coefficient Lymphocytes to Total Leucocytes.	P. Value.
Pre-starvation, pregnant and non-pregnant.....	33	0·6132	·001	0·5628	·001
Starvation, no disease.....	42	0·7298	·001	0·5324	·001
Disease.....	53	0·9800	·001	0·2395	—

N.B.—It has previously been pointed out that pregnancy *per se* made no difference to the blood counts. When plotted graphically it was seen that the pregnant and non-pregnant pre-starvation figures were in the same general scatter and the two sub-groups were combined as one.

Table 7 shows that whereas, in the non-affected sheep, fluctuations in the total leucocytes were due to fluctuations in neutrophiles and lymphocytes almost to an equal degree, in sheep showing domsiekte the neutrophiles had assumed such dominance as to account almost *in toto* for fluctuations in the total leucocytes.

Graph IV also illustrates the point. Here the neutrophiles and lymphocytes per c.mm. are plotted against the total leucocytes per c.mm. It will be seen here that in all the higher leucocyte counts the total is made up almost entirely by the increase in neutrophiles. It will also be noted that the total neutrophiles per c.mm. are above the average in all cases except where the total leucocyte count is very low. The lymphocytes on the other hand are well below the average even with high leucocyte counts and show no correlation to the total.

It was noted that where a high percentage of neutrophiles was associated with a high total leucocyte count, i.e. when there was a marked rise in the absolute number of neutrophiles, immature polymorphs were frequently encountered. This usually occurred towards the termination of the disease. More often,, however, high neutrophile percentages were not associated with high leucocyte counts, the increase in the percentage of neutrophiles being largely due to a drop in the lymphocytes; in these instances no immature forms were seen.

The Eosinophiles.

In passing it is of interest to note the low percentage of eosinophiles encountered throughout the work (2·57 per cent.). This may possibly be attributed to the fact that the sheep had been clean of worms for many months.

The Figures for Individual Animals.

A study of the figures from individual animals gives a clearer indication of the blood changes. It would appear that from the time the ration was cut there was a drop in the circulating lymphocytes and a rise in the neutrophiles which was reflected in the percentages of the elements. This occurred rapidly in the pregnant sheep, the neutrophiles exceeding the lymphocytes in an average period of seven days. In the non-pregnant sheep there was a long period of semi-starvation before these changes became manifest, the average period between the cutting of the ration and the neutrophiles exceeding the lymphocytes being 26 days. It will be seen that these periods correspond very closely to the time taken for the appearance of symptoms. In every sample taken from sheep actually suffering from the disease the neutrophiles exceeded the lymphocytes.

Graphs V, VI, VII and VIII are given as illustrations of this phenomenon.

The Correlation between Neutrophiles and Lymphocytes.

In none of the groups could any correlation be found between the total numbers of neutrophiles and lymphocytes.

The Correlation between Neutrophiles and Blood Ketones.

Having established that there is a rise in the number of neutrophiles associated with domsiekte, it was decided to try to correlate this with the rise of ketone bodies in the blood.

For this purpose the sheep were divided into two groups—pregnant and non-pregnant.

It was found that in the pregnant sheep there was a significant correlation between the percentage of neutrophiles and the ketones in the blood (expressed as acetone). The coefficient in this case being 0·7226 (p.001). In the case of the non-pregnant sheep, however, the coefficient was only 0·2331 which is not significant.

This is an additional indication that this high neutrophile percentage is, at least in pregnant sheep, closely connected with the domsiekte complex. It is also a peculiar point of difference between the pregnant and the non-pregnant animal. This difference is of particular interest in view of the fact that domsiekte is well known to be usually connected with pregnancy and, although some of our non-pregnant sheep showed symptoms, it was much more easily produced in pregnant animals.

It must also be mentioned that the three readings taken from non-pregnant sheep showing the disease were 68 per cent.,75 per cent. and 83 per cent. neutrophiles. A high neutrophile percentage was therefore also connected with domsiekte symptoms in the non-pregnant sheep, when they did occur.

Summary.

1. It is shown that in sheep showing clinical symptoms of domsiekte the number of lymphocytes in the blood is abnormally low while that of neutrophiles is high. In 53 counts the average percentages of these elements were:— Neutrophiles, 70·9 per cent; and lymphocytes, 26·6 per cent.

2. In pregnant ewes this blood change followed rapidly after the cut in the ration and after a longer period in non-pregnant ewes. In pregnant ewes the percentage of lymphocytes had dropped to below 50 in an average period of semi-starvation of seven days, while in non-pregnant ewes this period averaged 26 days. These periods correspond closely to the time taken for the appearance of symptoms.

3. In the pregnant ewes a positive correlation was found between the percentage neutrophiles and the blood ketones (expressed as acetone). Conversely there would be negative correlation between percentage lymphocytes and blood ketones.

4. The rise in neutrophiles and fall in lymphocytes counterbalanced each other so as to keep the average leucocyte count within the normal range.

Discussion.

Roderick and Harshfield (1932) give a number of differential counts from affected sheep which show abnormally low percentages of lymphocytes and correspondingly high figures for the neutrophiles, but no mention of this change is made in the text.

As is shown in the section dealing with the pathology, the lymphopaenia can be explained by the marked decrease of lymphocytopoietic activity noted in the lymphnodes and spleen. The origin of the increase in neutrophiles is more difficult to explain but it may be compensatory. Biedl and Ecastello (1901) record that ligation or opening of the thoracic duct in dogs was followed by a drop in the circulating lymphocytes and a rise in polymorphs.

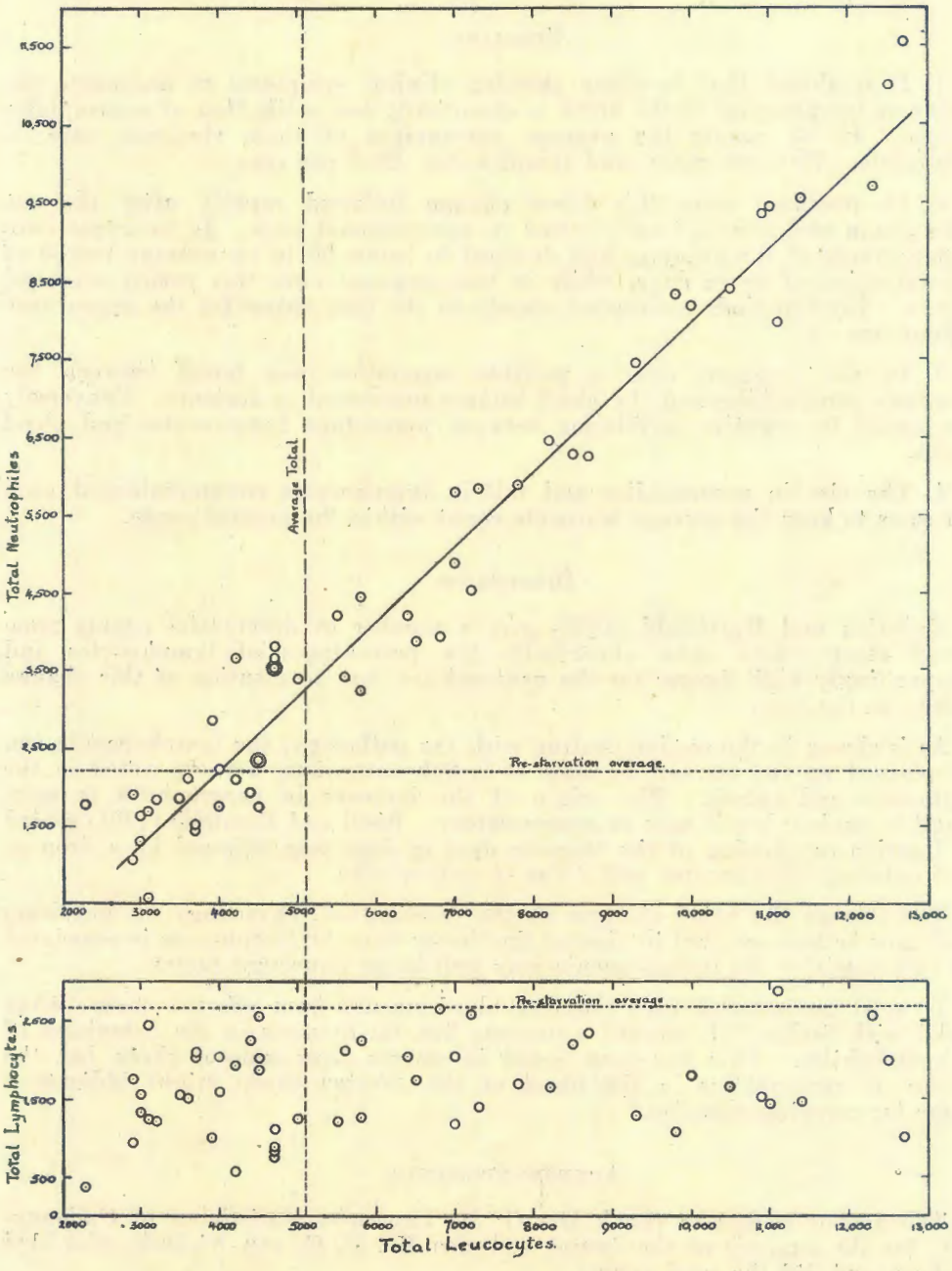
The rôle of the blood changes in the pathological physiology of domsiekte cannot now be assessed, but in view of the theory that the lymphocyte is associated with cell nutrition the lymphopaenia may well be an important factor.

It must be recorded here that the blood smears from affected sheep, when stained with Sudan III, showed numerous fine fat droplets in the cytoplasm of the neutrophiles. This has been noted in smears from normal sheep but the increase of neutrophiles in the blood of the affected sheep might indicate a greater fat carrying capacity.

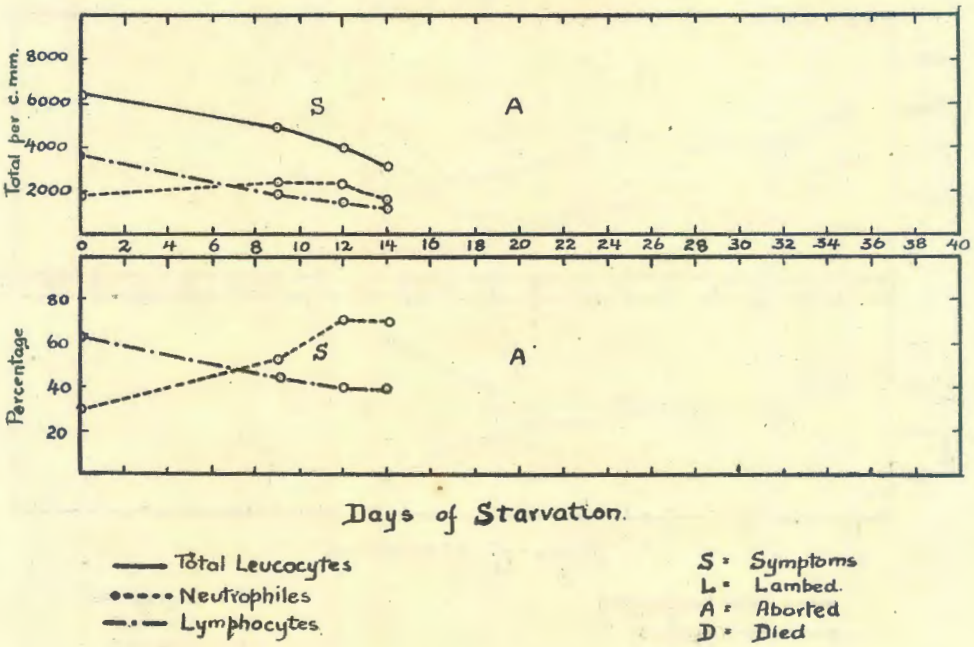
Acknowledgments.

The author wishes to thank Dr. G. B. Laurence, statistician at Onderstepoort, for the analysis of the figures and also Mr. P. C. van Niekerk, who bled the sheep and did the total counts.

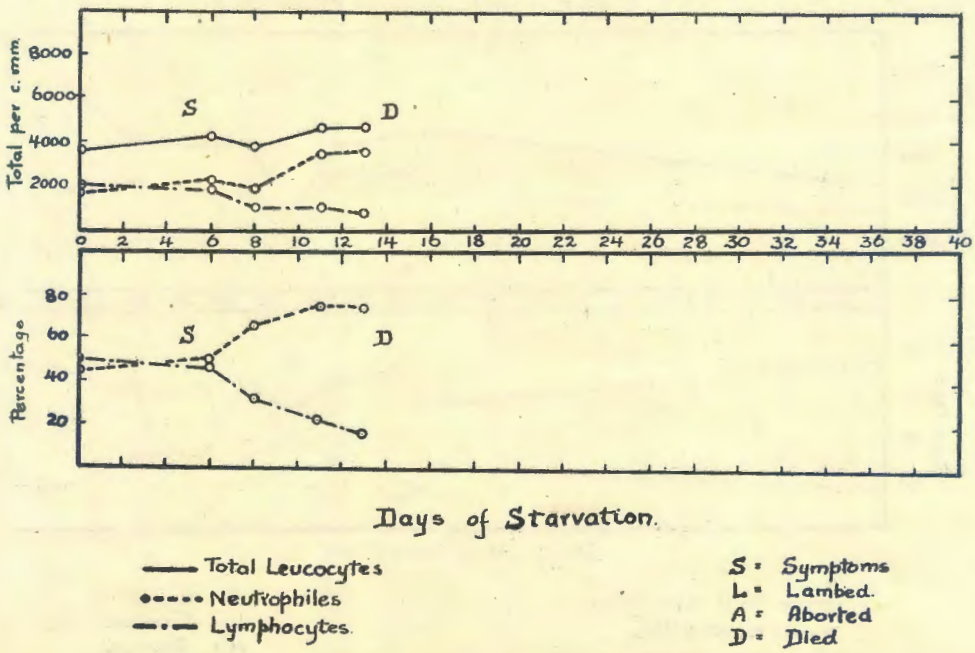
GRAPH IV.—Relation of Lymphocytes and Neutrophiles to Total Leucocytes.



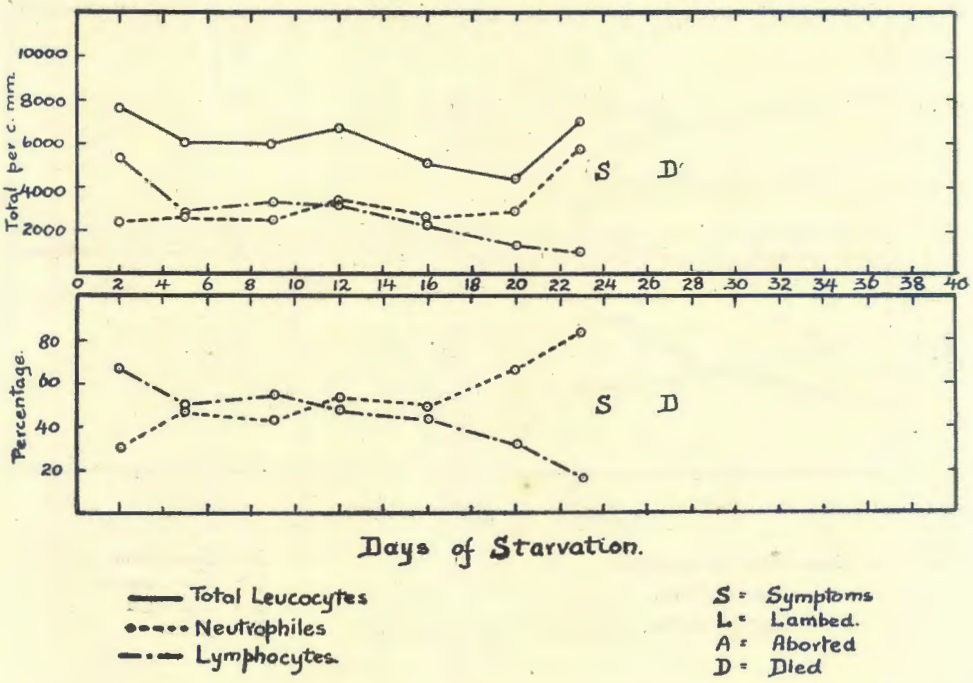
GRAPH V.—Sheep 23 (Pregnant).



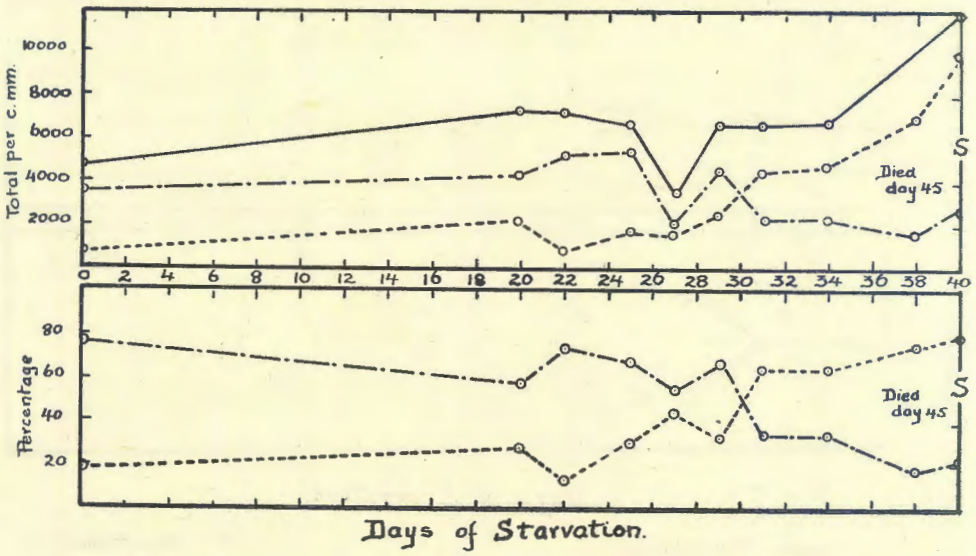
GRAPH VI.—Sheep 34 (Pregnant).



GRAPH VII.—Sheep 14 (Pregnant).



GRAPH VIII.—Sheep 24 (Non-pregnant).



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GENERAL DISCUSSION.

The condition produced in the experiment was identical, from the clinical and pathological standpoint, with the disease known as " Domsiekte ". We, therefore, have no reason to doubt that we have produced " Domsiekte " experimentally. De Kock (1928) has stated that domsiekte is identical with Pregnancy Disease of Sheep as reported from other countries, and the present work can be said to have proved this without doubt. If the clinical symptoms, chemical findings and pathological changes described in this paper are compared with those described in the literature (see Part I) they are seen to correspond in all the major points.

It is felt that an attempt must be made to define " Domsiekte " or pregnancy disease more accurately than has been done hitherto. The frequency of the reference to pregnancy in the popular names for the condition are evidence of how closely the factor of pregnancy has been associated with the disease. The authors consider that this is not justified, as least from a scientific standpoint, seeing that an identical condition has been set up in non-pregnant ewes. It is felt that pregnancy is only a powerful predisposing cause and acts through the increased drainage of the maternal body. It is, however, admitted that circumstances severe enough to cause the clinical condition in non-pregnant animals will seldom arise under normal farming conditions.

We must now ask ourselves when we are justified in making a diagnosis of domsiekte. The symptoms are fairly typical but similar pictures may be seen in many other conditions such as certain plant poisonings, gid, and the early stages of heartwater. When the chemical data is correlated with the clinical symptoms (see Tables 8 to 12), it will be seen that in most instances there was an acetonaemia and hypoglycaemia at the time symptoms were manifest. There are, however, certain exceptions to be noted. Sheep 6, 30 (group 3, Table 10) and 13 (group 4, Table 11) showed symptoms while exhibiting a relatively high blood sugar figure together with acetonaemia. Symptoms were not actually osberved in Sheep No. 11 (group 4, Table 10) although the blood figures would indicate the presence of the disease. However, this sheep aborted and transitory clinical symptoms may well have been missed. The individual resistance to the condition probably varies considerably. In the non-pregnant group, No. 1 showed typical symptoms and post-mortem changes, although the rise in acetone and drop in blood sugar were slight. On the other hand Sheep No. 29 did not show symptoms despite a marked acetonaemia at one stage but did develop clinical signs of the disease later, when the blood acetone had dropped.

These anomalous examples show that there is no direct correlation between symptoms on the one hand and acetonaemia and hypoglycaemia on the other and we are still in doubt as to the actual cause of the symptoms.

The main pathological changes, fatty infiltration of the liver, is by no means specific.

We are, therefore, forced to the conclusion that, in the present state of our knowledgde, a diagnosis of domsiekte is only justified when the clinical, biochemical and pathologic aspects have been viewed as a whole.

The condition can, therefore, be defined as follows: " A disease of sheep, usually occurring in late pregnancy, and characterised by nervous symptoms, hypoglycaemia, acetonaemia and fatty infiltration of the liver."

GENERAL SUMMARY.

Undoubted cases of Domsiekte have been produced by suddenly cutting the ration of good conditioned heavily pregnant ewes.

An identical condition has been set up in non-pregnant ewes but a much longer period on the poor diet was necessary than in the pregnant ewes.

Details of the diets, loss of weight of the animal, clinical symptoms, chemical analyses of the blood and urine, pathological changes and blood changes are recorded.

There is no doubt that the Domsiekte produced is identical with the " Pregnancy Disease " reported from other countries.

GENERAL CONCLUSION.

Domsiekte can be produced by a sudden reduction in the diet of sheep.

Domsiekte is identical with " Pregnancy Disease " of other countries.

Table 8

No.	Age Period.	Date Ration Cut.	Date Aborted or Lambed.	Gestation Period.	Date of First Symptoms.	First Symptoms after Cut of Ration.	Symptoms and Intensity of Symptoms.
2	Four tooth	—	28/3/40 aborted	137 days	—	—	21/3/40: Diarrhoea—off feed
22	Eight tooth	—	24/3/40 aborted	134 days	—	—	21/3/40: Diarrhoea—off feed
12	Six tooth	—	—	P.M. carried out before completion	—	—	Showed no symptoms
10	Eight tooth	—	12/4/40 lambed	147 days	—	—	Showed no symptoms
26	Six tooth	—	18/4/40 lambed	149 days	—	—	Showed no symptoms
17	Six tooth	—	21/4/40 lambed	149 days	—	—	Showed no symptoms

NOTE.—All chemical data, except Hb. and T.N., are expressed as mgm. %.

Table 9

No.	Age Period.	Date Ration Cut.	Date Aborted or Lambed.	Gestation Period.	Date of First Symptoms.	First Symptoms after Cut of Ration.	Symptoms and Intensity of Symptoms.
3	Six tooth	7/3/40	27/3/40 lambed	142 days	23/3/40	16 days	23/3/40: Dull, listless and nervous 26/3/40: Partly blind, dull, listless, nervous, unsteady and deaf
20	Six tooth	9/3/40	28/3/40 lambed	139 days	27/3/40	18 days	27/3/40: Dull, listless and nervous
25	Eight tooth	14/3/40	29/3/40 lambed	134 days	—	—	Showed no symptoms
35	Four tooth	24/3/40	—	P.M. carried out before completion	2/4/40	9 days	2/4/40: Dull, listless, nervous, unsteady, blind and deaf
8	Six tooth	1/4/40	1/4/40 lambed	120 days	—	—	Showed no sypmtoms

NOTE.—All chemical data, except Hb. and T.N., are expressed as mgm. %.

Table 8 (*cont.*)

Group No. 1, Normal Pregnant Ewes: Normal Rati

Date and Cause of Death.	Post Mortem Changes.	Date Bled.	Hb. gm. Per Cent.	T.N. gm. Per Cent.	N.P.N.	U.N.
19/4/40; slaughtered for P.M.	Slight fatty changes liver; marked regressive changes kidney; fat adrenal cortex; fat necrosis	8/3	14·2	3·20	30·3	12·5
—	—	11/3	12·7	2·85	27·7	14·4
19/4/40; slaughtered	Killed as control; slight fatty infiltration liver, otherwise normal; pregnant	11/3 1/4	13·6 13·0	2·81 2·77	26·3 26·3	8·7 12·1
—	—	13/3 3/4	14·4 12·9	2·94 2·85	29·5 25·9	13·5 7·1
—	—	13/3 3/4 18/4	16·9 — 14·1	3·36 2·92 2·83	27·0 34·5 50·0*	11·8 12·3 30·7*
—	—	15/3 5/4	16·7 15·2	3·25 3·00	24·0 24·2	8·0 8·7

Table 9 *(cont.)*

Group No. 2, Pregnant Ewes: One Ounce Ca

Date and Cause of Death.	Post Mortem Changes.	Date Bled.	Hb. gm. Per Cent.	T.N. gm. Per Cent.	N.P.N.	U.N.
—	—	6/3	13·4	2·88	29·3	15·1
		23/3 26/3	15·2 15·8	— 3·26	35·3 27·8	— 11·9
28/4/40; P.M.	Chronic metritis. Marked fatty infiltration liver; marked regressive changes kidney; fatty degeneration adrenal cortex; fat necrosis	8/3 23/3 26/3 28/3 30/3 1/4	13·9 15·8 16·0 13·5 — 14·6	3·18 — 3·27 3·12 3·39 3·14	30·8 40·0 28·8 30·6 40·8 35·1	13·3 — 13·5 11·8 19·0 14·4
19/4/40; P.M.	Marked fatty changes liver and regressive changes kidney	11/3 19/4	13·4 —	2·85 —	31·6 150·0	15·6 —
8/4/40	Slight fatty changes liver and regressive changes kidney; fatty changes adrenal cortex; necrosis; pregnant	15/3 3/4 5/4	14·2 12·9 12·1	2·70 2·90 2·67	29·5 32·0 28·0	12·2 16·2 13·3
—	—	18/3	16·2	3·23	30·6	8·2

TABLE 8.* (*cont.*)

ant Ewes: Normal Ration Throughout Experiment.

BLOOD.								
A.A.N.	Total Chol.	Free Chol.	Lipoid P.	Total Lipids.	Sugar.	Acetone + Aceto Acetic Acid.	β. Hydroxy-butyric Acid (as acetone).	Grand Total (as acetone).
6·7	123	75	8·7	434	60·6	0·81	0·61	1·42
6·2	96	62	7·8	420	64·1	0·68	1·04	1·72
6·5	97	65	8·0	428	43·5	0·35	0·90	1·25
6·7	86	62	8·0	313	48·8	0·32	0·97	1·29
7·4	104	74	8·3	445	55·5	0·48	1·93	2·41
7·0	95	65	7·3	362	62·5	1·28	2·90	4·18
6·3	92	76	8·3	378	39·7	0·81	3·09	3·90
7·1	—	—	—	—	50·0	—	—	—
5·3	109	67	8·2	342	83·3*	1·93	3·09	5·02
6·4	108	70	8·4	412	41·0	0·48	0·97	1·45
6·7	103	69	8·5	387	35·7	2·58	4·51	6·79

* Above normal. Dystockia.

TABLE 9.* (*cont.*)

ant Ewes: One Ounce Cane Sugar Supplement.

BLOOD.								
A.A.N.	Total Chol.	Free Chol.	Lipoid P.	Total Lipids.	Sugar.	Acetone + Aceto Acetic Acid.	β. Hydroxy-butyric Acid (as aectone).	Grand Total (as acetone).
7·0	99	66	8·3	417	40·0	0·39	1·16	1·55
—	132	67	7·9	282	28·6	—	—	11·22
7·3	100	70	8·4	289	23·6	—	—	9·67
7·0	152	76	9·3	468	55·5	1·42	3·11	4·53
—	126	76	8·4	319	38·5	—	—	17·79
7·5	121	75	8·4	313	25·0	—	—	25·14
8·2	109	69	9·1	387	38·0	—	—	31·33
8·6	152	83	9·9	430	55·0	—	—	12·38
7·2	104	73	9·7	344	48·1	0·64	2·58	3·22
6·4	92	65	8·7	462	47·6	0·53	1·96	2·49
—	—	—	—	—	100·0	—	—	3·29
6·8	133	65	8·0	378	46·3	0·97	1·61	25·8
6·5	113	66	8·0	350	24·7	16·76	13·54	30·3
5·9	109	66	9·6	301	41·3	14·15	23·53	37·63
8·2	100	75	9·2	395	47·6	0·32	0·64	0·96

Table 8 (*cont.*)

Urine.							
Date Urine Collected.	C.c. Urine.	(Acetone + Aceto Acetic Acid (as acetone.)		β. Hydroxybutyric Acid (as acetone).		Total Acetone Bodies per 100 c.c. Urine (as acetone).	Grand Total as Acetone for 24 Hours.
		Per 100 c.c.	24-Hour Total.	Per 100 c.c.	24-Hour Total.		
9/3	220	1·55	3·41	2·71	5·96	4·3	9·37
12/3	644	1·55	7·58	2·80	18·03	4·2	25·61
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
14/3	1300	1·35	17·55	2·03	26·39	3·4	43·94
4/4	2450	4·83	118·33	0·44	10·78	5·3	129·11
14/3	490	22·24	108·98	4·16	20·38	26·4	129·36
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
16/3	280	5·80	16·24	5·61	15·71	11·4	31·95
6/4	1450	—	—	—	—	6·0	84·44

Table 9 (*cont.*)

Urine.							
Date Urine Collected.	C.c. Urine.	Acetone + Aceto Acetic Acid (as acetone).		β. Hydroxybutyric Acid (as acetone).		Total Acetone Bodies per 100 c.c. Urine (as acetone).	Grand Total as Acetone for 24 Hours.
		Per 100 c.c.	24-Hour Total.	Per 100 c.c.	24-Hour Total.		
—	—	—	—	—	—	—	—
24/3	190	—	—	—	—	68	130·43
27/3	710	27·56	195·68	9·67	68·66	37	264·34
—	—	—	—	—	—	—	—
24/3	380	—	—	—	—	33	126·39
27/3	265	147·95	392·07	18·37	48·68	16	440·75
—	—	—	—	—	—	—	—
31/3	325	24·66	80·14	8·22	26·72	33	106·86
2/4	360	6·00	21·60	5·02	18·07	11	39·67
12/3	208	3·29	6·84	9·38	19·50	12	26·34
—	—	—	—	—	—	—	—
4/4	480	160·59	770·83	29·98	143·89	190	914·72
6/4	118	—	—	—	—	71	84·44
—	—	—	—	—	—	—	—