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Chemical Blood Studies.

VI. A Serial Study over a 12 Month Period of Some Organic Constituents in "Laked" and "Unlaked" Blood Filtrates of Healthy Sheep (Merino) of Various Ages.*

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CONTENTS.

* Accepted as Thesis for the M.Sc. degree by the Pretoria University, December, 1932. Groups C, D and E and a few additional analyses in Groups A and B have been subsequently incorporated. The other titles of the series will be found under "References".

A. INTRODUCTION.

In view of the fact that there are no figures available for most of the organic constituents of blood for any of the domestic animals under South African conditions and relatively few data from other countries, this research work was initiated.

Many of the figures recorded in the literature are of little value, since they were obtained from a small number of animals, examined only a very few times and because as a rule no information as regards breed, diet, environment, etc., are stated. Furthermore, the period over which blood was withdrawn was short—no serial analyses over any length of period (say one year) having been found recorded. Also quite a number of figures present analyses of blood collected at slaughter houses and analysed after varying periods, usually several hours after withdrawal. Owing to the instability of most of the blood constituents such figures must be regarded with caution.

Since South African conditions vary greatly as compared with those of other countries in regard to variable rainfall, periodic droughts, and other climatic factors, these figures will be of considerable value for comparative purposes, particularly as the same animals were repeatedly bled during the various seasons.

It may be stated that this experiment was carried out during a period of exceptional drought, the rainfall being the minimum for the last 30 years for this area, and this may have influenced to some degree the composition of the blood. Of the influence of humidity and external temperature on composition practically nothing is known.

In this series various other articles (Graf, 1933) dealing with different infectious diseases of stock have been published, and it was felt that accurate "n ormal" data were imperative for the purposes of evaluating the data in respect to what could be regarded as "pathological" and what as "normal". In the articles referred to, analyses of blood were undertaken before infection in order to supply a comparative basis, but, if once "normal ranges" for the various blood constituents have been determined, this procedure would largely become redundant. Analyses could then be undertaken at any time during the course of a disease and compared with the "normal range" for any particular type of animal. In this article, however, only the composition of sheep's blood will be considered.

The main purpose of the data is therefore to give such figures of healthy Merino sheep, under stated conditions as to provide a comparative basis for pathological conditions. A fixed ration (except for an allowance of green feed during the summer) was adhered to throughout, except where otherwise stated.

The following constituents have been determined: haemoglobin (Hb.), sugar, total nitrogen (T.N.), non-protein nitrogen (N.P.N.), urea nitrogen (U.N.), total creatinine nitrogen (T.C.N.), uric acid nitrogen (U.A.N.), and amino-acid nitrogen (A.A.N.).

It is intended to continue with the determination of other constituents like cholesterol, pigments, ammonia ,lactic acid, etc., also physico-chemical determinations such as viscosity, hydrogen ion concentration, sedimentation rate of cellular elements, etc., in order to obtain as extensive information as possible on the normal composition and physical properties of the blood of domestic animals.

Five groups, arranged according to age and sex, were examined.

The analyses were done over a period of 15 months in the case of adult sheep, and 11 months in the case of lambs, figures over a relatively long period of time being thus obtained.

A satisfactory method for the preparation of " unlaked " blood filtrates was published by Folin (1930), and because of the following reasons, such filtrates together with the usual " laked " blood filtrates were analysed:

(1) To acquire normal figures for both filtrates in order always to be able to compare them with both " laked " and " unlaked " figures published by other research workers.

(2) For comparing " laked " with " unlaked ", since there may be great differences in the concentration of the constituents, in these two filtrates. This difference may be wholely normal or possibly of pathological significance (e.g. the difference between " laked " and " unlaked " blood will not only be a result of the presence of disintegration products of the cells which may be formed during the dissolution of the cell, but also as a direct result of the constitution of the cells as far as concentration of the different constituents in the plasma and cell are concerned. In the case of the urea only a small difference between the " laked " and " unlaked " blood is noted and the view that the urea concentration in cells and plasma are about the same, is thus strengthened. On the other hand, a difference of about 19 per cent. is noted in the sugar concentration in " laked " and " unlaked " filtrates, " laked " containing the higher figure. The explanation can only be ascribed to two factors viz.: (*a*) that through the laking of the cells substances which may react with the sugar reagent are liberated, and (*b*) that the actual concentration of sugar is higher in the cells. If (1) is not taken into consideration it would be possible to calculate the percentage sugar in the cells, provided, of course, that the cell volume is known.)

(3) The " unlaked " blood analysis may prove to be more valuable, as more information becomes available than the " laked " blood analysis, Wu (1932), Folin and Svedberg (1930).

B. TECHNIQUE.

(*a*) Arrangement of Groups (A-E).

Twenty-three sheep were classified according to age and sex into the following groups:—

Group A.—Six adult ewes. (Of this group one died during the experiment, 23.9.32 S. 24163. Two more sheep were excluded from the experiment after 6 months: S. 24156 and S. 24160).

Group B.—Three young lambs born of the above ewes during the experiment (one excluded after 6 months, S. 33589).

Group C.—Three six-tooth ewes. Two excluded after 6 months, S. 22204, S. 25142).

Group D.—Six ewe lambs (one excluded after 6 months, S. 29471).

Group E.—Five six-tooth wethers (two excluded after 6 months: S. 31662 and S. 31905).

In order to keep the environmental conditions the same for all groups, all these sheep were permitted to run in the same camp and access to the same feed troughs and water supply.

(*b*) Anthelminthic Treatment.

All the sheep, except of course the lambs of group B, were examined for worms (through the courtesy of Dr. H. O. Mönnig) and showed only a very slight infection, chiefly of wireworm (*Haemonchus contortus*). Once every month the animals were dosed with Government Wireworm Remedy (see also 1st paper of this series).

Length of Wool.—At the start of the experiment the wool was ½ inch long. All the sheep except the three young lambs were shorn on the 8th February, 1932.

Environment.—The sheep were kept throughout in the same pen sufficiently large to permit of ample exercise. Shelter was available to provide protection against the sun, wind, cold and rain.

Rations.—The following ration was supplied: 1 lb. crushed mealies per sheep and dry grass *ad lib.*, were supplied at 6.30 a.m. Also dry grass *ad lib.*, at 4.30 p.m.; green fodder *ad lib.* (whenever available during the summer months), except from 24th December, 1932, to the end of the experiment. In addition, one oz. of salt per sheep was provided on Thursdays.

It was not considered of sufficient value to determine accurately the intake of food by each individual animal, since the present work is not so much concerned with how the food influences the blood composition, but rather a study of the blood composition on a relatively fixed diet, as was pointed out before to provide normal figures as a basis for pathological studies. This system also furthermore permits of seasonal variations in the normal composition of the blood, whether due to diet, environmental temperature, humidity, etc., or not, to be taken into consideration. It, therefore, allows for an accurate comparison of the figures obtained for the various constituents in health and during any particular infection.

The weights of the animals recorded below their respective tables of data give a clear indication that the animals were in good condition and progressed normally as far as increase in weight is concerned. The food supplied was above a mere maintenance ration.

In order to have a further check on the state of health of these sheep, they were daily temperatured, and in no case was an abnormal reaction encountered.

(*c*) Methods of Chemical Analyses.

All the methods utilized and any modifications that were deemed advantageous have been fully recorded in the first paper of this series (Chemical Blood Studies I. See under " References ").

(*d*) Arrangement of Experimental Data.

Complete tables of analytical data (" laked " and " unlaked ") for every sheep in a group together with the weights and history are given for each group, followed by a discussion of every constituent for that particular group.

The urea (46·66 per cent. N) uric acid (33·3 per cent. N) and the " total " creatinine nitrogen (37 per cent. N) are expressed both as " N " and as such. The lowest column on the tables is the rest nitrogen, which was determined by subtracting from the non-protein nitrogen the urea nitrogen, amino acid nitrogen, uric acid nitrogen, and the " total " creatinine nitrogen. As the rest-nitrogen is obtained by calculation, the figures are obviously not absolute, but are influenced by the limits of experimental error of the various fractions.

In all five groups this arrangement is adhered to. Thereafter a summary and comparison of the combined groups is succeeded by tables showing a comparison of these data with those obtained by other workers.

Use is made of graphs to elucidate some points (Graph I, p. 165; II, p. 178; III, p. 186; IV, p. 187).

The following abbreviations have been used, both in the tables, in the text, and on the graphs:—

L = " laked ".
U = " unlaked ".
S = sheep.
Hb = haemoglobin.
T.N. = Total nitrogen.
N.P.N. = Non-protein nitrogen.
U.N. = Urea nitrogen.
T.C.N. = " Total " creatinine nitrogen.
U.A.N. = Uric acid nitrogen.
A.A.N. = Amino-acid nitrogen.
R.N. = Rest-nitrogen.
Av. = Average.
t.l. = too low to be determined colorimetrically.
No. = number.
detms. = determinations.
diff. = difference.
" L ".A. = " laked " group A.
" L ".B. = " laked " group B.
" U ".A. = " unlaked " group A.
" U ".B. = " unlaked " group B.
anal. and an = analysis.

C. EXPERIMENTAL DATA.

(*a*) Group A, Tables (1-17), Graph I and Discussion of Group A.

Sheep No. 15398, Table 1.
,, No. 24136, Table 2.
,, No. 24156, Table 3.
,, No. 24158, Table 4.
,, No. 24160, Table 5.
,, No. 24163, Table 6.

TABLE 1.—Sheep 15398.

Date.		4th Nov., 1931.	6th Nov., 1931.	2nd Dec., 1931.	10th Dec., 1931.	10th March, 1932.	12th April, 1932.	19th April, 1932.	22nd April, 1932.	27th April, 1932.	4th July, 1932.	8th July, 1932.	30th Sept., 1932.	15th Dec., 1932.	22nd Dec., 1932.	24th Jan., 1933.	27th Jan., 1933.
Haemoglobin, gm. per 100 c.c..		16·54	14·72	15·42	14·28	13·87	12·28	12·42	13·87	14·95	17·51	17·18	13·31	16·29	12·94	13·87	13·68
.....	L	42·74	54·05	51·81	38·17	48·54	43·29	—	45·45	47·62	47·39	39·06	38·61	50·76	47·39	43·10	46·87
Sugar, mg. %. (Glucose).....	U	31·90	41·66	37·04	33·67	40·32	36·10	—	31·75	39·22	34·25	34·01	29·41	40·00	32·15	38·17	31·25
Total-N., gm. N %.....		2·842	2·896	2·996	2·856	2·926	2·926	2·856	2·828	3·003	3·234	3·094	3·024	2·807	2·758	2·877	2·786
	L	21·72	23·36	30·0	30·0	27·78	19·23	21·82	18·63	24·20	23·54	17·44	19·23	42·54	45·46	26·78	22·22
Non-Protein Nitrogen. mg. N %.....	U	15·79	14·63	26·55	22·06	17·14	10·94	12·82	11·15	16·48	12·50	10·71	15·00	33·88	39·46	16·76	14·02
	L	2·820	2·875	2·960	2·826	2·898	2·907	2·834	2·809	2·979	3·210	3·077	3·005	2·764	2·712	2·850	2·764
Coaguable Nitrogen. gm. N %.....	U	2·826	2·883	2·963	2·834	2·909	2·915	2·843	2·817	2·987	3·221	3·083	3·009	2·773	2·719	2·860	2·772
mg. N %.....	L	10·11	11·42	18·61	11·72	5·66	4·65	5·49	4·33	4·56	3·83	3·35	3·44	18·51	31·53	6·69	3·60
mg. U %.....		21·21	23·94	39·08	24·60	12·80	9·70	11·50	9·10	9·50	8·00	7·00	7·14	38·85	66·15	14·07	7·56
Urea. mg. N %.....	U	10·49	11·20	17·02	11·90	7·51	4·71	5·41	4·79	4·48	3·65	t. 1	3·76	15·53	31·53	5·49	3·35
mg. U %.....		22·00	23·52	35·70	24·99	15·75	9·87	11·34	10·00	9·40	7·66	t. 1	7·98	32·55	66·15	11·55	7·14
mg. N %.....	L	1·94	1·86	2·66	2·54	2·23	1·97	1·90	2·05	2·23	2·01	2·23	2·04	2·36	2·36	2·66	2·11
mg. TC %.....		5·24	5·02	7·20	6·86	6·00	5·32	5·14	5·54	6·00	5·40	6·00	5·50	6·36	6·36	7·20	5·68
"Total"—Creatinine. mg. N %.....	U	1·60	1·44	2·08	2·14	1·82	1·49	1·49	1·56	1·49	1·49	1·38	1·71	1·90	1·90	1·82	1·67
mg. TC %.....		4·32	3·86	5·64	5·76	4·90	4·00	4·00	4·22	4·00	4·00	3·72	4·60	5·14	5·14	4·90	4·50
mg. N %.....	L	·44	·24	·44	·39	·45	·33	·23	·21	·33	·38	·33	·27	·18	·39	·35	·39
mg. UA %.....		1·33	·71	1·31	1·18	1·36	1·00	·69	·64	1·00	1·16	·100	·82	·55	1·18	1·04	1·18
Uric acid. mg. N %.....	U	—	—	·30	·13	·18	·15	·13	·12	—	·16	·14	·08	·13	·16	·22	·18
mg. UA %.....		—	—	·91	·38	·53	·44	·40	·35	—	·48	·41	·25	·41	·47	·66	·53
Amino-Acid, mg. N %.	L	5·56	5·18	7·18	7·00	7·53	7·00	8·75	6·36	8·24	5·43	4·93	6·73	6·03	7·00	7·00	6·36
	U	4·52	4·24	6·36	5·96	5·18	4·12	4·67	4·67	5·60	4·38	3·41	5·42	3·61	4·73	5·15	4·21
Rest Nitrogen, mg. N %.	L	3·67	4·66	1·11	8·36	11·91	5·88	5·45	5·68	8·84	11·89	6·60	6·75	14·46	3·18	10·08	8·71
	U	·82*	— 2·25*	·79	1·93	2·45	0·47	1·12	·01	4·91*	2·82	5·78	4·03	11·71	0·14	4·08	4 61

History : The sheep had bluetongue in September, 1926.
* Includes uric acid N.
Weights : 18.12.31 — 116 lb.
22. 1.32 — 136½ lb.
8. 2.32 — lambed, lamb No. 33589.
23. 2.32 — 110 lb.
29. 4.32 — 105 lb.
26. 5.32 — 111 lb.
22. 7.32 — 122 lb.
24. 8.32 — 130 lb.
17.10.32 — lambed.
29.12 32 — 104 lb.

TABLE 2.—Sheep 24136.

Date.		11th Nov., 1931.	13th Nov., 1931.	17th Dec., 1931.	18th Dec., 1931.	22nd March, 1932.	30th March, 1932.	12th April, 1932.	22nd April, 1932.	27th April, 1932.	17th May, 1932.	19th May, 1932.	9th June, 1932.	28th June, 1932.	29th June, 1932.	30th Sept., 1932.	15th Dec., 1932.	26th Jan., 1933.	30th Jan. 1933.
Haemoglobin, gm. per 100 c.c.		12·42	12·13	14·95	17·18	13·31	12·59	12·59	14·95	14·49	14·28	13·12	14·95	14·08	11·82	10·99	15·42	12·28	12·79
Sugar, mg. %. (glucose)	L	30·21	31·95	26·98	36·50	40·00	42·19	37·45	40·82	42·55	33·33	34·84	42·01	42·74	56·18	43·29	42·01	35·97	33·90
	U	25·90	27·80	19·61	25·00	34·72	34·97	33·11	32·36	35·59	30·49	31·15	35·46	34·25	51·28	40·00	35·46	32·62	29·07
Total-N., gm. N %.		2·716	2·660	2·702	2·709	2·842	2·772	2·758	2·877	2·898	2·961	2·870	2·975	2·828	2·694	2·485	2·632	2·632	2·562
Non-protein N. mgm. %	L	17·65	32·78	28·56	23·24	20·14	16·39	18·07	17·14	17·04	15·15	16·04	—	14·28	22·72	17·14	37·50	21·58	21·96
	U	11·77	27·78	20·49	15·80	13·45	11·41	14·56	14·28	12·29	10·94	11·71	—	9·37	12·60	12·45	31·58	14·56	16·58
Coaguable Nitrogen. gm. N %	L	2·698	2·627	2·773	2·686	2·822	2·756	2·740	2·860	2·881	2·946	2·854	—	2·814	2·651	2·468	2·594	2·611	2·540
	U	2·704	2·632	2·782	2·693	2·829	2·761	2·743	2·863	2·886	2·950	2·858	—	2·819	2·661	2·473	2·601	2·617	2·545
Urea. mg. N %	L	3·69	17·69	13·04	8·34	7·58	4·32	6·71	7·09	5·71	3·27	3·35	—	2·64	3·65	3·55	15·95	6·24	7·70
mg. U %		7·6	37·0	27·3	17·5	15·8	9·0	14·0	14·7	11·97	6·8	7·0	—	5·5	7·6	7·40	33·69	13·02	16·17
mg. N %	U	3·83	17·61	13·29	8·75	7·37	4·81	6·94	7·00	5·35	3·35	2·84	—	1·00	4·12	3·65	15·95	6·24	7·33
mg. U %		8·0	36·96	27·8	18·3	15·4	10·08	14·5	14·7	11·2	7·0	6·0	—	2·1	8·6	7·6	33·69	13·02	15·33
"Total" Creatinine. mg. N %	L	2·55	2·48	2·55	—	2·06	2·06	2·06	1·49	2·01	1·86	1·75	1·89	2·11	3·34	2·29	2·01	1·64	1·89
mg. TC %		6·86	6·70	6·86	—	5·54	5·54	5·54	4·0	5·40	5·02	4·70	5·14	5·68	9·00	6·16	5·40	4·40	5·14
mg. N %	U	1·82	2·04	2·23	—	1·41	1·56	1·52	1·40	1·41	·95	1·49	1·56	1·41	2·11	2·01	1·89	1·37	1·67
mg. TC %		4·90	5·54	6·00	—	3·78	4·22	4·10	3·78	3·80	2·56	4·00	4·16	3·80	5·68	5·40	5·14	3·72	4·50
Uric acid. mg. N %	L	—	·18	·18	·21	·17	·23	·14	—	·19	·17	·39	·19	·22	—	·22	—	·16	·20
mg. UA %		—	0·53	0·55	0·64	0·52	0·68	0·42	—	0·57	·53	1·18	·58	·65	—	·67	—	·47	·61
mg. N %	U	—	·16	—	—	·08	·13	—	—	—	·12	·14	·18	·16	—	·08	—	·10	·09
mg. UA %		—	0·47	—	—	0·25	0·39	—	—	—	·35	·43	·55	·47	—	·23	—	·31	·28
Amino-acid, mg. N %.	L	4·52	4·83	5·83	5·60	5·47	5·83	5·83	5·83	5·60	5·0	4·83	4·83	3·68	5·71	4·67	5·07	5·00	5·38
	U	3·90	4·67	4·12	4·83	4·67	4·67	4·52	5·00	5·38	4·12	3·68	3·18	2·98	4·36	4·35	3·68	4·54	5·07
Rest Nitrogen, mg. N %	L	6·89*	7·25	6·86	9·09†	4·86	3·95	3·33	2·82*	3·53	4·85	5·72	—	5·63	10·02*	6·41	13·47*	8·54	6·79
	U	2·22*	2·99	·85*	2·22†	— ·08	·24	1·58*	0·88*	0·15*	2·40	3·56	—	3·82	3·01*	2·36	9·06*	3·21	2·42

* Includes Uric acid N.
† Includes "T" Creatinine N.

History: The sheep had bluetongue in June, 1929.
Weights: 18.12.31 — 94 lb. lambed, 29.12.31, lamb No. 33208.
23. 2.32 — 85 lb.
29. 4.32 — 91 lb.
26. 5.32 — 90 lb.
22. 7.32 — 92 lb.
24. 8.32 — 96 lb.
13.10.32 — lambed.
29.12.32 — 85 lb.

TABLE 3.—Sheep 24156.

Date.		4th Nov., 1931.	6th Nov., 1931.	2nd Dec., 1931.	10th Dec., 1931.	12th April, 1932.	15th April, 1932.	19th April, 1932.	22nd April, 1932.	27th April, 1932.	3rd May, 1932.	9th May, 1932.
Haemoglobin, gm. per 100 c.c.		13·31	13·31	13·68	13·31	14·28	15·42	16·87	17·84	17·51	17·18	17·51
Sugar, mg. %. (Glucose)	L	38·17	43·48	39·84	34·01	39·37	43·48	—	33·67	40·90	44·05	40·82
	U	27·18	42·37	26·74	29·33	33·56	36·36	—	30·77	32·26	33·56	30·21
Total N., gm. N %		2·919	2·884	2·940	2·968	3·136	3·087	3·178	3·234	3·332	3·290	3·143
Non-Protein Nitrogen. mgm. N %	L	20·34	22·72	33·32	29·70	29·42	21·42	30·78	25·00	23·24	28·56	19·23
	U	9·68	13·04	25·00	21·72	16·94	13·63	19·73	15·00	18·29	18·87	12·40
Coagulable Nitrogen. gm. N %	L	2·899	2·861	2·907	2·938	3·107	3·066	3·147	3·209	3·309	3·261	3·124
	U	2·909	2·871	2·915	2·946	3·119	3·073	3·158	2·219	3·314	3·271	3·131
Urea. mg. N %	L	3·92	11·20	15·40	12·61	10·24	4·95	10·70	9·95	4·71	8·95	4·37
mg. U %		8·20	23·52	32·34	26·46	21·50	10·30	22·47	20·80	9·87	18·80	11·20
mg. N %	U	3·54	10·24	16·62	12·32	9·93	4·92	9·63	9·93	7·33	8·90	5·06
mg. U %		7·40	21·50	34·86	25·83	20·80	10·30	20·20	20·80	15·40	18·70	10·50
mg. N %	L	2·05	1·86	2·80	2·88	2·14	2·23	2·05	1·90	2·35	2·28	2·01
mg. TC %		5·54	5·02	7·58	7·78	5·76	6·00	5·54	5·14	6·36	6·61	5·40
"Total" Creatinine. mg. N %	U	1·44	1·44	2·05	2·36	1·56	1·90	1·40	1·40	1·60	1·75	1·34
mg. TC %		3·86	3·86	5·54	6·40	4·22	5·14	3·78	3·78	4·32	4·70	3·60
Uric acid. mg. N %	L	·33	·27	·44	·39	·30	·29	·21	·23	·33	·29	·27
mg. UA %		1·0	·80	1·33	1·18	·89	·86	·63	·69	1·00	·88	·80
mg. N %	U	—	—	·20	·13	—	·13	—	—	—	·14	·12
mg. UA %		—	—	·61	·40	—	·38	—	—	—	·41	·36
Amino-acid, mg. N %.	L	5·83	5·60	6·36	6·60	7·00	7·00	7·37	6·36	6·67	7·37	6·36
	U	4·83	3·94	5·18	5·43	4·12	4·67	5·38	4·52	4·83	4·00	4·12
Rest Nitrogen, mg. N %.	L	8·21	3·79	8·32	7·22	9·74	6·95	10·45	6·56	9·18	9·67	5·22
	U	— ·13	— 5·24	·95	1·48	1·33	2·01	3·32	— ·85	4·53	4·08	1·77

History: Bluetongue, June, 1929.
Weights: 18.12.31 — 86 lb.
22. 1.32 —100 lb.
23. 2.32 — 93 lb.
29. 4.32 — 95 lb.
18. 5.32 — transferred to trypanosome experiment

TABLE 4.—Sheep 24158.

Date.		5th Nov., 1931.	10th Nov., 1931.	17th Dec., 1931.	18th Dec., 1931.	17th March, 1932.	21st March, 1932.	30th March, 1932.	12th May, 1932.	19th May, 1932.	9th June, 1932.	28th June, 1932.	29th June, 1932.	12th July, 1932.	30th Sept., 1932.	15th Dec., 1932.	22nd Dec., 1932.	24th Jan., 1933.	30th Jan., 1933.
Haemoglobin, gm. per 100 c.c.		16·87	16·87	14·72	20·60	14·28	16·87	15·19	14·28	14·72	13·68	15·19	14·50	14·50	12·13	18·20	14·08	17·51	15·71
Sugar, mg. %. (Glucose)	L	41·84	43·86	37·31	46·51	54·98	51·81	50·76	59·52	50·00	55·25	52·08	36·23	51·02	43·86	51·81	42·55	41·66	40·65
	U	35·59	35·41	30·77	34·48	46·08	43·48	41·66	42·19	40·98	44·25	43·10	33·78	37·88	35·59	45·25	34·48	37·88	26·46
Total-N, gm. N %		3·146	3·150	3·045	3·080	2·940	2·996	2·954	2·856	3·066	2·835	3·010	2·996	2·954	2·800	2·793	2·751	3·150	2·828
Non-protein N., mg. N %	L	23·42	25·52	35·70	20·00	31·42	27·78	19·61	22·22	20·00	—	25·46	26·54	19·73	20·83	48·38	36·36	31·74	27·78
	U	17·24	14·20	29·36	14·28	18·00	15·15	13·70	12·77	12·75	—	14·28	14·08	12·00	12·82	38·72	28·04	18·75	16·86
Coagulable Nitrogen, gm. N %	L	3·113	3·124	3·009	3·060	2·909	2·968	2·934	2·834	3·046	—	2·985	2·971	2·934	2·779	2·745	2·751	3·118	2·800
	U	3·119	3·136	3·016	3·066	2·922	2·981	2·940	2·843	3·053	—	2·996	2·982	2·942	2·787	2·755	2·723	3·131	2·811
Urea. mg. N %	L	10·24	6·50	12·15	7·26	11·65	4·81	4·35	4·71	3·00	—	5·25	3·88	5·15	4·80	18·05	20·05	8·30	8·10
mg. U %		21·5	13·65	25·5	15·20	24·45	10·10	9·10	9·9	6·3	—	11·00	8·10	10·80	10·10	38·00	42·21	17·43	17·01
Urea. mg. N %	U	9·99	5·67	14·38	7·26	11·42	4·63	4·29	4·71	3·08	—	3·45	—	3·00	4·51	15·66	20·05	8·30	8·53
mg. U %		20·95	11·90	30·25	15·20	24·00	9·70	8·90	9·90	6·40	—	7·20	—	6·30	9·45	32·97	42·21	17·43	17·85
mg. N %	L	2·14	—	—	—	2·01	2·17	2·14	2·11	1·64	1·91	2·66	2·49	2·35	2·17	2·29	2·49	2·11	2·36
mg. TC %		5·76	—	—	—	5·40	5·84	5·76	5·68	4·40	5·14	7·2	6·74	6·36	5·84	6·16	6·47	5·68	6·36
"*Total*" *Creatinine.* mg. N %	U	1·82	—	—	—	1·38	1·67	1·56	1·54	1·45	—	1·97	1·60	1·67	1·67	1·89	1·90	1·75	1·78
mg. TC %		4·90	—	—	—	3·72	4·50	4·22	4·61	3·86	—	5·32	4·32	5·40	4·50	5·14	5·14	4·70	4·80
mg. N %	L	·48	·32	·38	·42	·41	·27	·29	·29	·30	·27	·31	—	·27	·27	·21	·43	·49	·38
mg. UA %		1·43	·97	1·14	1·25	1·24	·81	·86	·86	·91	·82	·94	—	·82	·82	·64	1·28	1·46	1·14
Uric acid. mg. N %	U	—	—	—	·13	·16	·15	·13	·10	·15	·17	·16	—	·12	·08	—	·15	·20	·11
mg. UA %		—	—	—	·38	·47	·44	·39	·31	·44	·50	·47	—	·36	·24	—	·45	·60	·33
Amino-acid, mg. N %.	L	6·83	6·03	7·14	7·00	6·10	8·24	7·78	6·06	5·49	5·22	5·60	5·83	5·18	6·86	5·00	7·00	7·61	5·94
	U	5·00	4·12	6·67	4·00	4·00	5·60	5·83	4·09	3·50	3·13	3·68	4·09	3·47	3·70	4·35	5·93	4·73	4·60
Rest Nitrogen, mg. N %	L	3·73	12·67*	16·03*	11·62*	11·25	12·27	5·05	5·05	9·57	—	11·64	13·34	6·78	6·73	26·55	5·39	11·26	11·00
	U	0·43	4·41*	8·31*	2·89*	1·04	3·10	3·68	1·89	4·57	—	5·01	7·07†	3·74	2·86	15·82	— 1·01	3·77	1·84

* Includes "Total"-creatinine-N.
† Includes Urea N.

History: Bluetongue, June, 1929.
Weights: 18.12.31 — 102 lb.
22. 1.32 — 118 lb.
19. 2.32 — lambed, lamb No. 33597.
23. 2.32 — 95 lb.
29. 4.32 — 98 lb.
26. 5.32 — 95 lb.
22. 7.32 — 107 lb.
24. 8.32 — 115 lb.
11.10.32 — lambed.
29.12.32 — 95 lb.

TABLE 5.—Sheep 24160.

Date.		5th Nov., 1931.	10th Nov., 1931.	17th Dec., 1931.	18th Dec., 1931.	17th March, 1932.	21st March, 1932.	30th March, 1932.	13th May, 1932.	17th May, 1932.
Haemoglobin, gm., per 100 c.c.		11·99	15·42	13·31	14·28	15·98	15·71	16·87	18·84	17·84
Sugar, mg. %. (Glucose)	L	41·84	34·48	42·00	41·00	44·25	43·67	45·45	59·52	50·00
	U	34·48	32·30	34·70	35·70	34·25	31·65	32·36	41·84	38·76
Total-N., gm. N %		3·150	3·017	2·709	2·772	3·220	3·136	3·241	3·220	3·234
Non-Protein N., mg. %.	L	20·34	—	25·20	20·00	36·82	28·04	25·00	21·58	24·46
	U	13·76	14·63	16·66	13·63	22·22	16·76	11·45	14·85	12·82
Coaguable Nitrogen, gm. N %.	L	3·130	—	2·684	2·752	3·183	3·108	3·216	3·198	3·210
	U	3·136	3·002	2·692	2·758	3·198	3·119	3·230	3·205	3·221
Urea. mg. N %	L	4·55	5·61	5·66	6·66	16·39	6·69	6·00	4·18	4·88
mg. U %		9·50	11·80	11·88	13·98	34·40	14·00	12·60	8·77	10·20
Urea. mg. N %	U	5·52	5·07	6·30	7·33	13·29	7·33	5·17	4·18	5·12
mg. U %		11·60	10·60	13·20	15·40	27·80	15·40	10·80	8·70	10·80
mg. N %	L	2·14	—	—	—	1·90	2·01	2·14	2·23	1·90
mg. TC %		5·76	—	—	—	5·14	5·40	5·76	6·00	5·14
"*Total*"-*Creatinine.* mg. N %	U	1·97	—	—	—	1·41	1·41	1·67	1·49	1·86
mg. TC %		5·32	—	—	—	3·80	3·80	4·50	4·00	5·02
mg. N %	L	·46	·31	·40	·45	·44	·27	·31	·30	·24
mg. UA %		1·39	·94	1·21	1·36	1·31	·80	·94	·91	·73
Uric acid. mg. N %	U	—	—	·14	·11	·17	·12	·13	—	·12
mg. UA %		—	—	·43	·34	·52	·35	·40	—	·36
Amino-acid, mg. N %.	L	6·83	6·09	6·73	7·00	7·00	7·78	7·78	7·00	7·00
	U	6·09	4·12	4·54	4·12	4·12	4·18	5·18	6·09	4·16
Rest Nitrogen, mg. N %.	L	6·36	—	12·41*	5·89*	11·09	11·29	8·77	7·87	10·44
	U	·18	5·44*	5·68*	3·07*	3·23	3·72	— ·70	3·09	1·55

* Includes "Total"-Creatinine-N.

History: Bluetongue, June, 1929.
Weights: 18.12.31 — 85 lb.
21. 1.32 — 83½ lb.
23. 2.32 — 81 lb.
29. 4.32 — 85 lb.
18. 5.32 — transferred to trypanosome experiment.

TABLE 6.—Sheep 24163.

Date.		6th Nov., 1931.	10th Nov., 1931.	17th Dec., 1931.	18th Dec., 1931.	16th March, 1932.	21st March, 1932.	31st March, 1932.	13th May, 1932.	19th May, 1932.	27th May, 1932.	3rd June, 1932.	7th June, 1932.	5th July, 1932.	7th July, 1932.
Haemoglobin, gm. per 100 c.c.		10·35	14·28	14·08	13·68	15·19	14·72	13·31	14·95	16·87	11·67	13·87	16·29	15·42	15·42
Sugar, mg. %. (Glucose)	L	42·19	34·48	45·45	41·32	38·31	47·74	42·37	37·59	38·31	46·73	41·84	45·05	45·05	47·62
	U	40·0	33·33	34·48	35·71	30·77	37·59	37·74	29·07	31·35	39·53	39·22	36·36	35·21	37·45
Total N., gm. N %.		2·380	2·926	2·590	2·716	3·248	2·912	2·758	2·947	3·164	2·576	2·870	3·003	3·052	3·066
Non-protein Nitrogen, mg. N %	L	13·39	20·40	28·04	35·70	27·26	29·42	16·66	15·00	17·54	14·08	15·68	16·94	19·48	15·39
	U	8·72	13·12	20·70	27·26	16·76	17·65	12·50	11·68	10·00	9·68	11·95	10·57	11·53	10·91
Coaguable Nitrogen, gm. N %.	L	2·367	2·920	2·562	2·680	3·221	2·883	2·741	2·932	3·146	2·562	2·853	2·986	3·033	3·051
	U	2·371	2·913	2·569	2·689	3·231	2·894	2·745	2·935	3·154	2·566	2·858	2·992	3·040	3·055
Urea. mg. N %.	L	3·90	4·35	9·52	15·66	9·31	6·35	4·72	3·26	3·16	2·70	2·84	1·85	3·76	2·57
mg. U %.		8·19	9·13	19·95	32·8	19·53	13·3	9·9	6·8	6·6	5·67	5·9	3·8	7·8	5·30
Urea. mg. N %.	U	3·46	3·42	9·52	15·66	9·42	6·32	5·25	4·4	2·77	2·51	2·84	1·25	2·71	t. l
mg. U %.		7·21	7·2	19·9	32·80	19·74	13·23	11·00	8·0	5·7	5·25	5·9	2·6	3·6	t. l
mg. N %.	L	1·71	—	—	—	1·86	1·90	1·97	1·82	1·60	1·82	2·01	2·09	1·82	1·86
mg. TC %.		4·64	—	—	—	5·02	5·14	5·32	4·90	4·32	4·90	5·40	5·68	4·90	5·02
"Total"-creatinine. mg. N %.	U	1·49	—	—	—	1·49	1·34	1·78	1·14	1·38	1·56	1·45	1·45	1·60	1·52
mg. TC %.		4·0	—	—	—	4·0	3·36	4·80	3·08	3·72	4·16	3·86	3·86	4·32	4·08
mg. N %.	L	·18	·27	·25	·33	·26	·20	·23	·22	·25	·18	·18	·23	·28	·27
mg. UA %.		·53	·80	·76	1·0	·78	·60	·68	·67	·76	·53	·53	·68	·84	·80
Uric Acid. mg. N %.	U	—	—	—	—	·17	·12	·13	—	·13	·08	·08	·11	·19	·14
mg. UA %.		—	—	—	—	·51	·35	·39	- -	·40	·25	·24	·32	·57	·43
Amino-acid, mg. N %.	L	5·15	5·28	6·86	6·36	5·83	5·47	6·67	5·60	5·18	5·60	5·83	5·58	4·06	4·97
	U	4·67	3·89	4·83	4·83	4·38	4·0	4·83	3·59	3·26	4·52	4·67	4·12	3·18	3·89
Rest Nitrogen, mg. N %.	L	2·45	10·50*	11·41*	13·34*	10·0	15·50	3·07	4·10	7·35	2·78	5·72	7·19	9·56	5·72
	U	·90	5·81*	6·35*	6·77*	1·30	5·87	·51	2·95	2·46	1·01	2·92	3·64	3·85	5·36

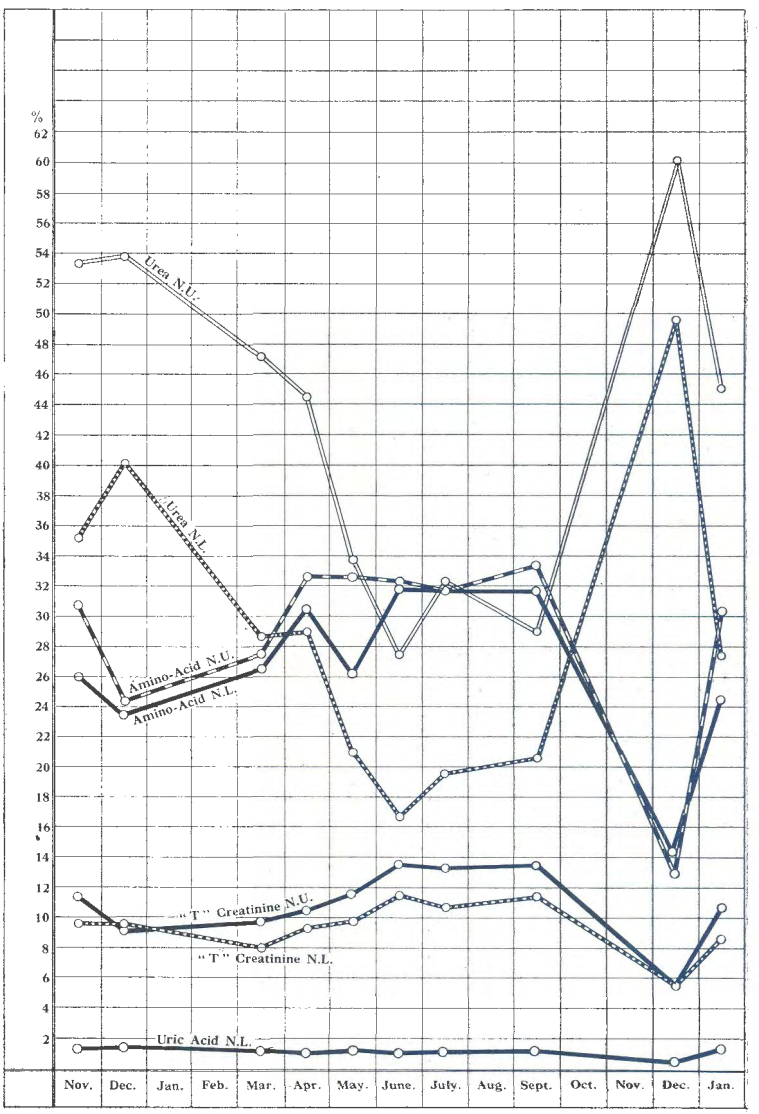
* Includes "Total" creatinine N.

History: Bluetongue, June, 1929.
Weights: 18.12.31 — 77 lb.
21. 1.32 — 88 lb.
23. 2.32 — 85 lb.
29. 4.32 — 87 lb.
26. 5.32 — 85 lb.
22. 7.32 — 92 lb.
24. 8.32 — 92 lb.
24. 8.32 — 94 lb.
15. 9.32 — died.

Explanation of Graphs I and II.

In order to emphasize the percentage variations of the various constituents (except haemoglobin, total nitrogen and sugar) both in the "laked" and "unlaked" blood filtrates over the whole period, nitrogen partition curves have been drawn, incorporating the monthly averages of all the different experimental data collected of a group as points for plotting the curves (Tables 7 to 17, 21 to 31).

Such nitrogen partition curves have only been drawn of groups A and B. As the curves of the other groups were found to show the same general tendencies, they were omitted.



Graph I.
Percentage Curves. Nitrogen Partition of Non-Protein Nitrogen.
Group A.

Group A (adult ewes.)

TABLE 7.—*Haemoglobin (Hb.)* gm. per 100 c.c.

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	15·6	14·9	—	—	13·9	13·4	—	—	17·3	—	13·3	—	—	14·6	13·8
24136	12·3	16·1	—	—	12·9	14·0	13·7	13·6	—	—	10·9	—	—	15·4	12·5
24156	13·3	13·5	—	—	—	16·4	17·3	—	—	—	—	—	—	—	—
24158	16·9	17·7	—	—	15·5	—	14·5	14·5	14·5	—	12·1	—	—	16·1	16·6
24160	13·7	13·8	—	—	16·2	—	18·3	—	—	—	—	—	—	—	—
24163	12·3	13·9	—	—	14·4	—	14·5	15·1	15·4	—	—	—	—	—	—
Av...	14·0	14·9	—	—	14·8	14·8	15·6	14·3	16·0	—	12·1	—	—	15·4	14·3

It is evident from the average haemoglobin figures per month of all the sheep, as well as from the monthly averages of individual sheep that there is no definite indication of a steady decrease or steady increase during the period. Plotted as a graph it would appear as a zigzag line. It may, however, be concluded that no seasonal variation in the haemoglobin content of blood takes place.

Neser (1923), working with horse blood, drew attention to similar variations in his researches on the " Percentage volume or count of red cells " in one and the same horse examined over short periods. He referred more particularly to variations encountered in the same animal, at the same time, in different parts of the circulation (venous and capillary), but his results obviously also apply to differences found in the same animal from day to day (in the absence of pathological conditions). (*Vide* also Chemical Blood Ssudies IV.)

Attention is drawn to the fact that Hb. figures at the beginning of the experiment were abnormally high or low. (See Tables 1, 5 and 6.)

The Hb. figures vary from 10·35 to 20·60 gm. per 100 c.c., the average of all the figures over the whole period of 15 months, being 14·7 gm. per 100 c.c.

The following table illustrates the distribution more clearly by showing the number of analyses falling into each particular group:—

From 10–11 gm. per 100 c.c.	2
11–12 gm. per 100 c.c.	3
12–13 gm. per 100 c.c.	10
13–14 gm. per 100 c.c.	15
14–15 gm. per 100 c.c.	22
15–16 gm. per 100 c.c.	12
16–17 gm. per 100 c.c.	9
17–18 gm. per 100 c.c.	9
18–19 gm. per 100 c.c.	2
19–20 gm. per 100 c.c.	0
20–21 gm. per 100 c.c.	1

39 per cent. of the determinations lie between 14 and 15 and 58 per cent. between 13 and 16 gm. per cent.

TABLE 8.—*Sugar (" Laked ") mg. per cent.*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	48·4	45·0	—	—	48·5	45·5	—	—	43·2	—	38·6	—	—	49·1	44·9
24136	31·1	31·7	—	—	41·1	40·3	34·1	47·0	—	—	43·3	—	—	42·0	34·9
24156	40·8	36·9	—	—	—	39·4	42·4	—	—	—	—	—	—	—	—
24158	42·9	41·9	—	—	52·5	—	54·8	47·9	51·0	—	43·9	—	—	47·2	41·2
24160	38·2	41·5	—	—	44·5	—	54·8	—	—	—	—	—	—	—	—
24163	38·3	43·4	—	—	42·8	—	40·9	43·4	46·3	—	—	—	—	—	—
Av...	39·9	40·1	—	—	45·8	41·5	44·4	46·4	46·0	—	41·9	—	—	46·9	40·4

TABLE 9.—*Sugar (" Unlaked ") mg. per cent.*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	36·8	35·4	—	—	40·3	35·7	—	—	34·1	—	29·4	—	—	36·5	34·7
24136	26·9	22·3	—	—	35·0	33·7	30·8	40·3	—	—	40·0	—	—	35·5	31·4
24156	34·8	28·0	—	—	—	33·2	32·0	—	—	—	—	—	—	—	—
24158	35·5	32·6	—	—	43·7	—	41·6	40·4	37·9	—	35·6	—	—	39·9	32·2
24160	33·4	35·2	—	—	32·8	—	40·3	—	—	—	—	—	—	—	—
24163	36·7	35·1	—	—	35·4	—	33·3	37·8	36·3	—	—	—	—	—	—
Av...	33·9	31·4	—	—	37·1	34·1	35·4	39·7	35·7	—	35·0	—	—	37·5	32·6

" Laked " filtrates.
min.-max. variation
27–59·5 mg. per cent.
av. 43·3 mg. per cent.
av. diff. 8·2 mg. per cent.

" Unlaked " filtrates.
min-max. variation
19·6–51·3 mg. per cent.
av. 35·1 mg. per cent.

The following table indicates the distribution:—

" Laked " filtrates.		*" Unlaked " filtrates.*	
mg. %	*Occurrence.*	*mg. %*	*Occurrence.*
25–30	1	15·–20	1
30–35	9	20–25	0
35–40	14	25–30	10
40–45	31	30–35	34
45–50	14	35–40	23
50–55	9	40–45	12
55–60	3	45–50	2
		50–55	1

38 per cent. of the " laked " filtrate determinations lie between 40 and 45 mg. per cent., and 73 per cent. between 35 and 50 mg. per cent., while 41 per cent. of the " unlaked " filtrate determinations lie between 30 and 35 and 83 per cent. between 30 and 45 mg. per cent.

Comparison.

The percentage difference of the " laked " and " unlaked " figures varies from 2·3 to 28·8 per cent., with the average difference of 8·2 mg. per cent. (43·3–35·1), i.e. the average difference is 19 per cent.

The " laked " blood sugar figures are always more than that of the " unlaked " filtrates. By comparison of the two curves (graph III) it is clear that the percentage difference decrease gradually towards winter (except from March to May), because the sugar content increases and the difference in mg. per cent. remains about the same (see Tables 8 and 9). Note the course of the curves from September, 1932, to the end.

The averages of sheep 24136 are exceptionally low and of S.24158 exceptionally high.

Total Nitrogen (T.N.). gm. per cent.

The total nitrogen varies from 2·7 to 3·3 gm. N. per cent. with an average of 3·0 gm. N. per cent.

By comparing the different figures of each set of figures of each individual sheep, it is noticed that the T.N. remains fairly constant.

The relation between the haemoglobin and total nitrogen is affirmed because usually the figures increase or decrease simultaneously, e.g. on Table 1 (4.7.32) both Hb and T.N. are high and on Table 2 (29.6.32) both are low. For individual differences compare Tables 2 and 3, those of 2 being low (e.g. 2·72, 2·66, 2·70, 2·84 etc.), and of 4 high (e.g. 3·14, 3·15, 3·05, 3·08, etc.).

TABLE 10.—*Non-Protein Nitrogen mg. per cent. " Laked ".*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	22·5	30·0	—	—	27·8	20·9	—	—	20·5	—	19·2	—	—	44·0	24·5
24136	25·2	25·9	—	—	18·3	17·4	15·6	18·5	—	—	17·1	—	—	37·5	21·8
24156	26·5	31·5	—	—	—	25·9	42·4	—	—	—	—	—	—	—	—
24158	24·5	27·9	—	—	26·3	—	21·1	25·5	19·7	—	20·8	—	—	42·4	29·8
24160	20·3	22·6	—	—	30·0	—	23·0	—	—	—	—	—	—	—	—
24163	16·9	31·9	—	—	24·5	—	15·5	16·8	17·4	—	—	—	—	—	—
Av...	22·0	28·3	—	—	25·5	22·2	19·5	20·3	19·2	—	19·1	—	—	42·0	25·3

TABLE 11.—*Non-protein nitrogen mg. per cent. " Unlaked ".*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	15·2	24·3	—	—	17·1	12·9	—	—	11·6	—	15·0	—	—	36·7	15·4
24136	19·8	18·1	—	—	12·4	13·7	11·4	10·9	—	—	12·5	—	—	31·6	16·0
24156	11·4	23·4	—	—	—	16·7	15·6	—	—	—	—	—	—	—	—
24158	15·7	21·8	—	—	15·6	—	12·8	14·4	12·1	—	12·8	—	—	33·4	15·3
24160	14·2	15·1	—	—	16·8	—	13·8	—	—	—	—	—	—	—	—
24163	10·9	23·9	—	—	15·6	—	10·5	11·3	11·2	—	—	—	—	—	—
Av...	14·5	21·1	—	—	15·5	14·7	12·6	12·1	11·5	—	13·4	—	—	34·3	15·6

" Laked " filtrates.

Minimum-maximum variation, 13·39–48·38, mg. % N.
Average, 24·0, mg. % N.

" Unlaked " filtrates.

Minimum-maximum variation, 8·72–39·46, mg. % N.
Average, 16·2, mg. % N.
Average difference, 7·8, mg. % N.

The following Table indicates the distribution:—

"Laked" filtrates.		*"Unlaked" filtrates.*	
mg. % N	*Occurrence.*	*mg. % N*	*Occurrence.*
Below 10	3	Below 10	4
15–20	23	10–15	43
20–25	29	15–20	21
25–30	18	Above 20	15
Above 30	13		

30 per cent. of the "Laked" filtrate determinations lie between 20–25 mg. per cent. N.

81 per cent. of the "Laked" filtrate determinations lie between 15–30 mg. per cent. N.

52 per cent. of the "Unlaked" filtrate determinations lie between 10–15 mg. per cent. N.

77 per cent. of the "Unlaked" filtrate determinations lie between 10–20 mg. per cent. N.

Comparison.

The difference of the "laked" and "unlaked" figures varies from 11·5 to 54·0 % with an average of 34·3 % and an average difference of 7·8 in mg. % N (24·0–16·2).

It is clear from Graph IV. that the percentage difference of N.P.N. in the plasma and cells, increased towards the winter, because the graphs are always about parallel when descending. This difference in mg. % N remains about the same (December, 1931, 25 %; July, 1932, 39 %). The N.P.N. increases from November to December and reaches the minimum towards July. It changes not much towards September, but towards December (1932), when green fodder was again included in the ration the Graph reaches the maximum, while in January when the green fodder was again excluded it declined again. Undoubtedly this change can partly, if not wholly, be ascribed to the change in the ration from December (1932) to the end of the experiment. But that the seasonal factor may play a part, cannot at this stage of the experiment be definitely excluded, and this aspect is still under investigation.

The individual differences are noticeable, e.g. S. 24156 which is high, and S. 24163 which is low.

TABLE 12.—*Urea Nitrogen mg. % "Laked".*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	10·8	15·2	—	—	5·7	4·6	—	—	3·6	—	3·4	—	—	25·0	5·7
24136	10·7	10·7	—	—	5·9	6·5	3·3	3·1	—	—	3·6	—	—	15·9	6·9
24156	7·6	14·0	—	—	—	8·1	7·2	—	—	—	—	—	—	—	—
24158	8·4	9·7	—	—	6·9	—	3·9	4·6	5·2	—	4·8	—	—	19·0	8·2
24160	5·1	6·2	—	—	9·7	—	4·5	—	—	—	—	—	—	—	—
24163	4·1	12·6	—	—	6·8	—	3·0	2·3	3·2	—	—	—	—	—	—
AV...	7·8	11·4	—	—	7·3	6·5	4·3	3·3	3·7	—	3·9	—	—	20·8	6·9

The urea nitrogen varies from 1·85 to 31·5 mg. % N, with an average of all the figures over the 15 months of 7·56 mg. % N.

The following Table indicates the distribution:—

mg. % N	*Occurrence.*
1–2	1
2–3	4
3–4	14
4–5	16
5–6	8
6–7	8
7–8	3
8–9	3
above 9	15

42 % of the determinations lie between 3 and 5 mg. % N.

A table of the "unlaked" figures will differ very little from Table 12 because the amount of urea in the cellular and plasma fraction of the blood is practically the same. Consequently only one curve for the "laked" and "unlaked" figures on Graph IV has been plotted. It must be stated, however, that with a few exceptions the "laked" figures are usually slightly more than the "unlaked". The symbols "t.l." (too low) indicate that the urea content was too low for accurate colorimetric readings to be taken, e.g. vide Table 1 (8.7.32) and Table 6 (7.7.32).

The maximum figure obtained for the "unlaked" filtrates is 31·53 mg. % N.

Comparison.

The urea nitrogen curve on Graph IV approximately parallels the N.P.N. curves of Group A. On account of the fact that the urea nitrogen curves practically coincide, it is evident that the urea nitrogen is approximately equally divided between the blood cells and plasma.

Although the urea N and N.P.N. curves are practically parallel, the urea N curve obviously is much lower, and from this it is apparent that the urea nitrogen percentage of the N.P.N. drops considerably from December (1931) to June (see Graph I and Table 12). Concerning the change in Graph IV and consequently also on Graph I the same factor that is mentioned (diet) under the N.P.N. is applicable here.

On Graph I the urea N percentage curves of the "laked" and "unlaked" blood filtrates are plotted. Although the urea N (mg. %) of blood determined on the "laked" and "unlaked" blood filtrates are the same, the urea N calculated as percentage of the respective N.P.N.'s (in mg. %) for the two filtrates, differ, because the N.P.N. for the two filtrates differ (Table 10 and 11). The "unlaked" urea N percentage curve runs much higher than the "laked" urea N percentage curve, since the respective N.P.N. (mg. %) is much lower. Note the individual differences (S. 15398 and S. 24163, see Table 12).

TABLE 13.—*" Total " Creatinine N mg. % (" Laked ").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	1·9	2·6	—	—	2·2	2·0	—	—	2·1	—	2·0	—	—	2·4	2·4
24136	2·5	2·6	—	—	2·1	1·9	1·8	2·5	—	—	2·3	—	—	2·0	1·8
24156	1·9	2·8	—	—	—	2·1	2·1	—	—	—	—	—	—	—	—
24158	2·1	—	—	—	2·1	—	1·9	2·4	2·35	—	2·2	—	—	2·4	2·2
24160	2·1	—	—	—	2·0	—	2·1	—	—	—	—	—	—	—	—
24163	1·7	—	—	—	1·9	—	1·7	2·1	2·1	—	—	—	—	—	—
Av...	2·1	2·7	—	—	2·04	2·0	1·9	2·3	2·0	—	2·2	—	—	2·3	2·1

TABLE 14.—*" Total " Creatinine N mg. % (" Unlaked ").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	1·5	2·1	—	—	1·8	1·5	—	—	1·4	—	1·7	—	—	1·9	1·2
24136	1·9	2·2	—	—	1·5	1·4	1·2	1·7	—	—	2·0	—	—	1·9	1·5
24156	1·4	2·2	—	—	—	1·6	1·5	—	—	—	—	—	—	—	—
24158	1·8	—	—	—	1·5	—	1·5	1·8	1·7	—	1·7	—	—	1·9	1·7
24160	1·9	—	—	—	1·5	—	1·7	—	—	—	—	—	—	—	—
24163	1·5	—	—	—	1·5	—	1·4	1·5	1·6	—	—	—	—	—	—
Av...	1·6	1·9	—	—	1·6	1·5	1·5	1·7	1·6	—	1·8	—	—	1·9	1·7

" Laked Filtrates.

Minimum-maximum variation, 1·49–2·88 mg. N %.
Average, 2·14 mg. N %.

" Unlaked " Filtrates.

Minimum-maximum variation, ·95–2·08 mg. N %.
Average, 1·62 mg. N %.
Average difference, 0·52 m. N% (laked to unlaked).

Comparison.

The difference between " laked " and " unlaked " " total " creatinine nitrogen lies between 2·1 and 48·9 % and the average difference is 24·5 %.

It is evident from the curves in mg. % N (Graph IV) that the percentage, difference between " laked " and " unlaked " figures increases towards winter since the curves run approximately parallel but descending (Nov. 21 %, Jul. 25 %).

On Graph I the percentage curve rises because, although the average on Tables 13 and 14 (Graph IV) fall a little bit towards winter, they do not fall proportionally as much as the respective non-protein nitrogens (see Tables 10 and 11).

Note the individual differences, e.g. on Table 13, c.f. S. 24163, which is low, with the others.

TABLE 15.—*Uric-acid Nitrogen mg. %* (" *Laked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	0·34	0·41	—	—	0·45	0·27	—	—	0·35	—	0·27	—	—	0·28	0·37
24136	0·18	0·19	—	—	0·20	0·11	0·28	—	—	—	0·22	—	—	t.l.	0·18
24156	0·30	0·41	—	—	—	0·27	0·28	0·13	—	—	—	—	—	—	—
24158	0·40	0·40	—	—	0·32	0·29	0·29	—	0·27	—	0·27	—	—	0·32	0·44
24160	0·38	0·42	—	—	0·34	0·27	—	—	—	—	—	—	—	—	—
24163	0·22	0·29	—	—	0·23	0·23	0·22	0·20	0·27	—	—	—	—	—	—
Av...	0·29	0·36	—	—	0·29	0·23	0·26	0·23	0·25	—	0·25	—	—	0·24	0·33

Minimum-maximum variation, from less than ·10 to ·48 mg. % N.

Average, ·28 mg. % N.

" *Unlaked* ".—No table of this is given, because too many of the filtrates contained undeterminable small quantities uric acid N. An average will thus be of no value.

Maximum, ·30 mg. % N.

Comparison.

The uric acid N (mg. %) in " laked and " unlaked " blood filtrates is very variable (e.g. *vide* Table 4) and so is also the relation in the two filtrates, even in the individual cases (e.g. Table 4, 5.11.31 and 18.12.31). In the first case the " unlaked " uric acid N was undeterminably low and the " laked " figure (·48 mg. % N) is the highest level ever obtained in these analyses. On the other hand, the " laked " figures of S. 24136 were always extremely low (Table 15). The curve (Graph IV) rises a bit towards December (1931), but maintains its level from March to July (c.f. averages on Table 15). The " unlaked " uric acid nitrogen curve is not drawn for reasons already given.

The percentage curve is approximately level at 1·3 % N (Graph I). Note the individual low averages of S. 24136 (·18, ·19, ·20, ·11, etc.), and the higher averages of S. 15398 (·34, ·41, ·45, ·27, etc.) (*vide* Table 15).

TABLE 16.—*Amino-Acid Nitrogen mg. %* (" *Laked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	5·4	7·1	—	—	7·5	5·6	—	—	5·2	—	6·7	—	—	6·5	6·6
24136	4·7	5·7	—	—	5·6	5·8	4·9	4·7	—	—	4·7	—	—	5·1	5·2
24156	5·7	6·5	—	—	—	6·9	6·9	—	—	—	—	—	—	—	—
24158	6·4	7·1	—	—	7·4	—	5·8	5·6	5·2	—	6·9	—	—	6·0	6·8
24160	6·5	6·9	—	—	7·5	—	7·0	—	—	—	—	—	—	—	—
24163	5·2	6·6	—	—	6·0	—	5·5	5·7	7·6	—	—	—	—	—	—
Av...	5·6	6·6	—	—	6·8	6·8	5·9	5·3	6·2	—	6·1	—	—	6·0	6·2

TABLE 17.—*Amino-Acid Nitrogen mg. % ("Unlaked").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
15398	4·4	6·2	—	—	5·2	4·8	—	—	3·9	—	5·4	—	—	4·2	4·7
24136	4·3	4·5	—	—	4·7	4·9	3·9	3·9	—	—	4·4	—	—	3·7	4·8
24156	4·4	5·2	—	—	—	4·7	4·1	—	—	—	—	—	—	—	—
24158	4·4	4·8	—	—	5·1	—	3·8	3·6	3·5	—	3·7	—	—	4·9	4·7
24160	5·1	4·3	—	—	4·5	—	5·1	—	—	—	—	—	—	—	—
24163	4·3	4·8	—	—	4·4	—	3·8	4·4	3·5	—	—	—	—	—	—
Av...	4·5	5·1	—	—	4·3	4·8	4·1	3·8	3·7	—	4·5	—	—	4·5	4·7

"Laked" Filtrates.

Minimum-maximum variation, 3·68–8·75 mg. % N.
Average, 6·37 mg. % N.

"Unlaked" Filtrates.

Minimum-maximum variation, 3·13–6·67 mg. % N.
Average, 4·43 mg. % N.
Average difference, 1·94 mg. % N.

Comparison.

The percentage difference of "laked" and "unlaked" figures varies from 9·3 to 46·7, with an average of 30·5. The curves in mg. % N run fairly constant (Graph IV) towards April (1932) and fall to a minimum in June (Tables 16 and 17). In November (1931) the difference was just over 1 mg. % N, but gradually the difference increases to 2·51 mg. % N in July, at the cost of the "unlaked" figures, that is in the "laked" the content remained fairly constant, whereas in the "unlaked" there was an earlier decrease. The percentage difference increased towards winter (December, 1931, 23 %, July 40 %, see Graph IV).

On Graph I the percentage curves are approximately parallel, because although the averages (see Tables 16 and 17) decrease somewhat, they do not do so as proportionally as the respective non-protein nitrogens. These curves were influenced by the change in the ration, rising with the withdrawal of green feed and falling with the addition of it.

Note the individual differences, e.g. S. 15398 being fairly high (5·4, 7·1, 7·5, 5·6, etc.), and S. 24136 being fairly low (4·7, 5·7, 5·6, 5·8, etc.).

(*b*) Group B, Tables (18-31), Graph II and Discussion of Group B.

Sheep No. 33208.
,, No. 33589.
,, No. 33597.

TABLE 18.—Sheep 33208.

Date		14th March, 1932.	18th March, 1932.	23rd March, 1932.	31st March, 1932.	14th April, 1932.	18th April, 1932.	21st April, 1932.	25th April, 1932.	28th April, 1932.	3rd June, 1932.	7th June, 1932.	11th July, 1932.	13th July, 1932.	29th Sept., 1932.	21st Dec., 1932.	25th Jan., 1933.	1st Feb., 1933.
Haemoglobin gm. per 100	U	16·54	14·08	15·42	15·42	12·13	14·28	13·68	13·12	13·31	11·96	14·49	13·68	13·87	11·96	14·95	16·54	12·59
Blood Sugar (*glucose*) mg. %	L	52·36	55·55	52·08	45·05	52·91	48·31	52·36	52·63	60·98	55·55	67·11	44·84	51·55	59·17	49·75	42·74	48·54
	U	46·73	52·08	49·02	39·68	47·17	46·51	46·72	58·82	55·55	51·28	62·11	43·29	44·44	51·22	45·66	35·84	43·29
Total N. gm. N %		3·066	3·024	3·038	3·024	2·702	2·842	2·730	2·604	2·646	2·835	2·611	2·926	2·800	2·632	3·024	3·129	2·590
Non-protein nitrogen mg. %	L	20·70	19·73	30·92	23·24	27·26	15·87	17·97	17·44	23·16	15·69	14·85	15·23	15·71	18·07	32·60	27·40	24·70
	U	12·82	12·35	23·24	14·71	24·58	11·53	11·49	13·83	15·00	9·73	11·41	10·49	10·71	11·36	25·86	17·65	18·41
Coaguable Nitrogen gm. N %	L	3·045	3·004	3·031	3·001	2·675	2·826	2·712	2·587	2·623	2·819	2·596	2·911	2·785	2·614	2·991	3·102	2·565
	U	3·053	3·012	3·015	3·009	2·677	2·830	2·715	2·590	2·631	2·825	2·600	2·916	2·790	2·621	2·998	3·111	2·572
Urea mg. N %	L	—	7·73	16·55	6·40	10·90	3·16	3·31	5·85	6·09	2·57	2·57	4·26	t.l.	3·76	17·69	8·01	9·00
Urea mg. U %	L	—	16·20	34·70	13·4	22·9	6·60	7·0	12·25	12·80	5·40	5·40	8·90	t.l.	7·00	37·17	16·80	18·90
Urea mg. N %	U	6·47	6·27	16·94	6·55	10·90	2·82	3·20	4·40	6·24	2·64	2·33	3·26	t.l.	3·76	18·05	7·58	11·80
Urea mg. U %	U	13·56	13·16	35·60	13·70	22·89	5·90	6·72	9·24	13·10	5·50	4·90	5·60	t.l.	7·90	38·01	15·96	24·78
"Total" Creatinine mg. N %	L	1·82	1·64	1·56	2·66	2·14	1·78	1·56	1·34	1·67	1·78	1·90	2·16	2·58	1·82	1·90	1·82	1·89
"Total" Creatinine mg. TC %	L	4·90	4·40	4·22	7·2	5·76	4·80	4·22	3·6	4·50	4·80	5·14	5·84	6·96	4·90	5·14	4·90	5·14
"Total" Creatinine mg. N %	U	1·38	1·34	1·67	1·56	2·05	1·44	1·34	1·26	1·34	1·55	1·51	1·75	2·04	1·45	1·60	1·26	1·56
"Total" Creatinine mg. TC %	U	3·72	3·60	4·50	4·22	5·54	3·88	3·60	3·42	3·60	4·16	4·08	4·70	5·50	3·92	4·32	3·86	4·16
Uric Acid mg. N %	L	·23	·11	·15	·14	·16	—	—	·13	·18	·12	·19	·13	·15	·18	·23	·26	·20
Uric Acid mg. UA %	L	·68	·34	·45	·42	·49	—	—	·39	·55	·37	·57	·40	·46	·53	·69	·78	·59
Uric Acid mg. N %	U	—	—	·12	·12	·13	·11	—	·13	—	·07	·12	·08	·09	·09	—	·17	·10
Uric Acid mg. UA %	U	—	—	·36	·36	·39	·32	—	·38	—	·22	·36	·25	·28	·28	—	·50	·29
Amino Acid mg. N %	L	6·5	5·38	5·83	7·14	5·47	7·00	6·36	6·36	5·83	5·53	4·67	4·81	4·67	5·15	6·36	5·83	6·03
	U	4·67	4·38	—	6·17	5·00	5·18	4·67	5·0	5·38	4·24	3·62	3·41	4·12	4·52	5·26	5·38	5·60
Rest Nitrogen mg. N %	L	12·15*	4·87	6·83	6·90	8·59	3·93†	6·74†	3·76	9·39	5·79	5·52	3·87	8·31	6·96	5·42	11·48	7·58
	U	·30	·36	4·51‡	·31	6·50	1·98	2·28†	3·04	2·04	1·23	3·83	1·99	4·46	1·54	− 0·05	3·26	− 0·67

* Includes Urea N. † Includes Uric Acid N. ‡ Includes Amino Acid N.

History; Born at Onderstepoort 29.12.31 of Ewe 24136 (*vide* Group A).

Weight; 29. 4.32 — 60 lb.
15. 5.32 — vasectomised.
26. 5.32 — 67 lb.
22. 7.32 — 65 lb.
24. 8.32 — 72 lb.
29.12.32 — 107 lb.

TABLE 19.—Sheep 33589.

Date		14th March, 1932,	18th March, 1932.	23rd March, 1932.	31st March, 1932.	14th April, 1932.	18th April, 1932.	21st April, 1932.	25th April, 1932.	27th April, 1932.	3rd June, 1932.	11th July, 1932.	13th July, 1932.	29th Sept., 1932.
Haemoglobin, gm. per 100 c.c.		13·31	14·28	15·71	16·54	13·68	13·31	13·87	16·29	13·87	13·12	14·49	14·08	12·13
Sugar, mg. %	L	78·74	70·92	67·11	62·89	58·14	59·52	62·60	54·94	69 93	63·69	53·76	57·80	55·87
(Glucose)	U	70·92	60·24	56·82	50·76	50·50	49·02	62·50	57·47	59·52	52·63	43·67	43·86	51·55
Total—Nitrogen, gm. N %		2·814	2·926	3·066	3·017	2·926	2·828	2·884	3·054	2·723	2·870	2·905	2·842	2·534
Non-Protein Nitrogen, mg. %	L	22·40	30·16	31·58	30·92	27·26	22·72	21·82	26·08	25·00	17·65	17·04	18·63	16·76
	U	13·32	22·98	22·90	18·38	18·75	12·66	15·00	14·28	14·35	10·71	9·43	11·11	10·60
Coaguable Nitrogen gm. %	L	2·792	2·896	3·034	2·986	2·899	2·805	2·862	3·026	2·698	2·852	2·888	2·823	2·517
	U	2·801	2·903	3·043	2·999	2·907	2·815	2·869	3·038	2·709	2·859	2·896	2·831	2·523
Urea mg. N %	N	7·70	11·34	13·29	8·90	6·14	5·27	4·88	5·78	5·66	3·00	1·63	3·16	—
Urea mg. U %	N	16·17	23·8	27·9	18·69	12·81	11·0	10·2	12·0	11·8	6·3	1·40	6·6	—
Urea mg. N %	U	7·00	12·99	13·81	8·71	6·07	5·45	4·10	5·78	5·35	3·26	t.l.	t.l.	1·44
Urea mg. U %	U	14·7	27·2	29·00	18·27	12·7	11·4	8·61	12·00	11·2	6·8	t.l.	t.l.	3·00
"Total"—Creatinine mg. N %	L	2·35	1·86	2·14	2·32	2·41	1·97	1·90	1·90	1·75	2·01	2·28	2·75	2·01
"Total"—Creatinine mg. TC %	L	6·36	5·02	5·76	6·26	6·54	5·32	5·14	5·14	4·70	5·40	6·16	7·44	5·40
"Total"—Creatinine mg. N %	U	1·45	1·49	1·40	—	2·05	1·22	1·22	1·56	1·34	1·75	2·01	2·16	1·60
"Total"—Creatinine mg. TC %	U	3·92	4·0	3·78	—	5·54	3·26	3·26	4·22	3·60	4·70	5·40	5·84	4·32
Uric Acid mg. N %	L	·20	·17	·24	·24	·31	·21	·20	·27	·38	·25	·21	·25	·25
Uric Acid mg. UA %	L	·60	·50	·73	·71	·93	·62	·59	·81	1·0	·74	·62	·76	·74
Uric Acid mg. N %	U	—	—	·12	·11	·13	·11	—	·12	·19	·14	·07	·10	·09
Uric Acid mg. UA %	U	—	—	·36	·34	·38	·32	—	·36	·57	·41	·22	·30	·28
Amino Acid, mg. N %	L	7·00	7·37	7·78	9·21	6·86	8·24	8·24	7·78	7·78	4·67	5·96	5·51	6·09
	U	4·67	5·18	—	3·89	4·67	5·83	5·38	5·15	5·60	2·72	4·02	4·52	4·49
Rest Nitrogen, mg. N %	L	5·15	9·32	8·13	10·25	11·54	7·03	6·60	10·35	9·48	7·72	6·96	6·96	—
	U	0·20	3·32	7·57*	5·67†	5·83	0·05	4·30	1·67	1·87	2·84	2·43	4·33	3·06

* Includes Amino Acid—N. † Includes "Total"—Creatinine—N.

History: Born at Onderstepoort. 8.2.32, of Ewe 15398 (*vide* Group A).

Weight: 29.4.32 — 48 lb.
15.5.32 — Vasectomised.
26.5.32 — 47 lb.
22.7.32 — 55 lb.
24.8.32 — 57 lb.
Excluded from experiment, October 1932.

TABLE 20.—Sheep 33597.

Date		14th March, 1932.	18th March, 1932.	23rd March, 1932.	31st March, 1932.	14th April, 1932.	18th April, 1932.	21st April, 1932.	25th April, 1932.	28th April, 1932.	27th May, 1932.	3rd June, 1932.	11th July, 1932.	13th July, 1932.	29th Sept., 1932.	21st Dec., 1932.	25th Jan., 1933.	30th Jan., 1933.
Haemoglobin gm,. per 100 c.c.		12·59	—	14·28	13·31	14·95	12·77	12·77	12·28	10·87	14·28	12·28	11·14	12·42	13·50	13·31	13·87	13·12
Sugar, mg. %	L	74·07	79·36	72·46	67·57	60·24	59·58	—	62·89	66·67	50·50	53·19	49·95	53·48	45·66	45·45	52·63	51·02
(Glucose)	U	63·69	—	66·23	60·61	48·08	54·64	—	60·60	58·82	39·68	45·05	44·25	45·05	40·82	40·82	45·05	40·49
Total-N., gm. N %		2·660	—	2·730	2·709	2·940	2·842	2·730	2·625	2·450	2·905	2·632	2·436	2·478	2·597	2·632	2·751	2·506
Non-Protein Nitrogen, mg. %	L	23·54	25·56	27·40	31·42	27·90	24·10	24·80	24·80	25·64	18·29	23·90	15·00	17·65	17·97	32·42	24·00	30·00
	U	14·16	—	21·43	23·42	20·70	14·63	14·02	15·00	15·15	10·23	13·04	9·31	10·53	9·86	24·58	15·79	23·56
Coaguable Nitrogen, gm. N %	L	2·636	—	2·703	2·678	2·912	2·818	2·705	2·601	2·424	2·887	2·608	2·421	2·460	2·576	2·600	2·727	2·576
	U	2·646	—	2·709	2·686	2·919	2·827	2·716	2·610	2·435	2·895	2·619	2·427	2·467	2·587	2·607	2·735	2·582
Urea																		
mg. N %	L	9·00	9·31	9·75	8·43	6·78	4·49	5·45	8·47	5·97	2·42	5·25	2·42	2·03	1·86	15·00	6·63	10·44
mg. U %	L	18·9	19·5	20·4	17·70	14·20	9·4	11·4	17·70	12·5	5·04	11·0	5·04	4·26	3·90	31·50	13·86	31·00
mg. N %	U	10·70	—	9·20	9·05	6·78	5·17	4·38	7·16	5·85	2·45	5·66	t.l.	t.l.	1·50	15·74	6·90	9·81
mg. U %	U	22·5	—	19·3	18·9	14·2	10·9	9·2	15·1	12·2	5·04	11·8	t.l.	t.l.	3·15	32·97	14·49	20·58
"Total"—Creatinine																		
mg. N %	L	2·10	1·78	1·97	2·41	2·39	2·41	1·67	1·56	1·67	2·04	2·16	2·85	2·04	2·11	2·28	2·23	2·29
mg. TC %	L	5·68	4·80	5·32	6·54	6·46	6·54	4·50	4·22	4·50	5·50	5·84	7·72	5·50	5·68	6·00	6·00	6·16
mg. N %	U	1·38	—	1·40	1·78	1·90	1·67	1·34	1·36	1·38	1·60	1·67	2·35	2·01	1·49	2·10	1·89	2·01
mg. TC %	U	3·72	—	3·78	4·80	5·14	4·50	3·60	3·60	3·72	4·32	4·50	6·36	5·40	4·00	5·68	5·14	5·40
Uric Acid																		
mg. N %	L	·27	—	·24	·24	·29	—	·15	·21	·26	·22	·21	·23	·23	·09	·43	·34	·29
mg. UA %	L	·80	—	·71	·71	·86	—	·44	·62	·78	·65	·64	·70	·70	·27	1·30	1·03	·86
mg. N %	U	—	—	·14	·13	·13	—	—	·11	·12	·10	·08	·11	·09	·08	·14	·24	·12
mg. UA %	U	—	—	·41	·38	·38	—	—	·33	·36	·31	·23	·32	·28	·24	·42	·72	·37
Amino Acid, mg. N %	L	6·86	7·37	8·24	9·33	8·97	8·75	7·0	7·78	7·78	6·36	6·67	5·74	5·64	5·93	7·07	7·00	6·87
	U	4·52	—	—	6·73	5·60	6·09	4·67	5·0	5·71	5·04	4·52	3·33	4·38	4·21	5·26	5·22	5·38
Rest Nitrogen, mg. N %	L	5·31	7·10*	7·20	11·01	9·47	8·45*	10·53	6·78	9·96	7·25	9·61	3·76	7·71	7·80	6·69	7·80	10·11
	U	−2·44	—	10·69†	5·73	6·29	1·70*	3·63	1·37	2·09	1·04	1·11	3·52	4·05	2·58	— 0·27	1·54	6·24

* Includes Uric Acid—N. † Includes Amino Acid—N.

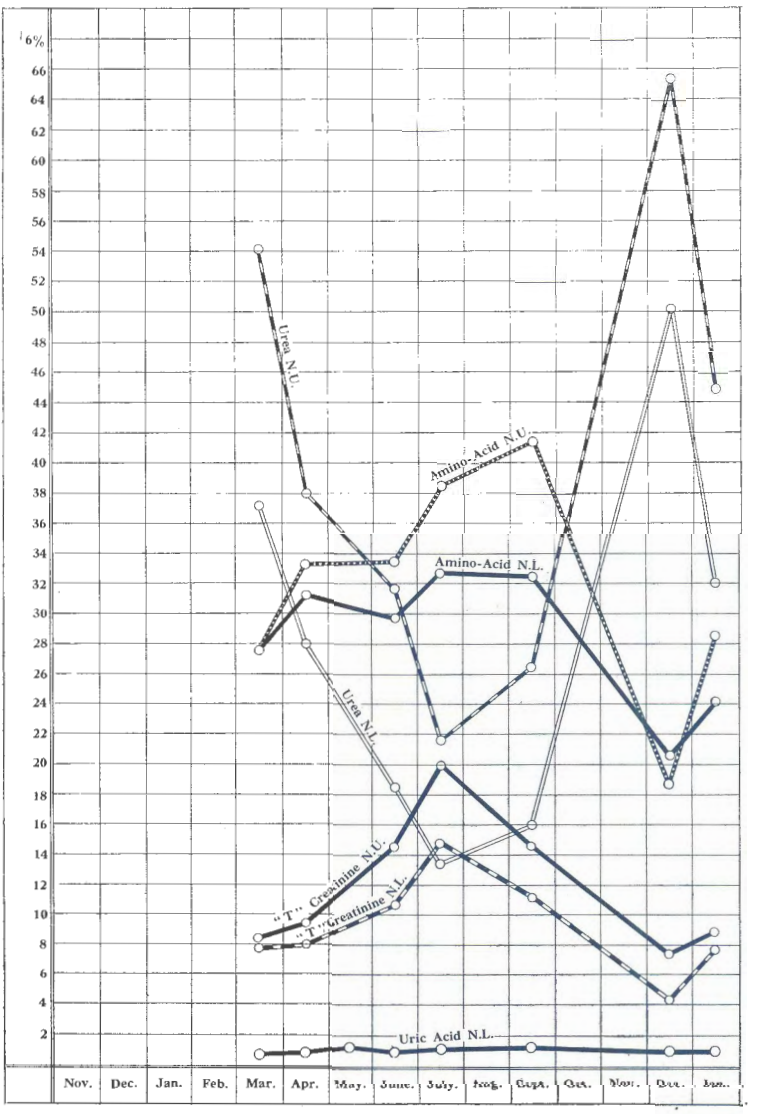
History: Born at Onderstepoort, 17.2.32, of Ewe 24158 (*vide* Group A).

Weight: 29. 4.32 — 39 lb.
26. 5.32 — 42 lb.
22. 7.32 — 47 lb.
24. 8.32 — 46 lb.
29.12.32 — 63 lb.

GRAPH II.

Percentage Curves. Nitrogen Partition of Non-Protein Nitrogen.

Group B.



Group B (lambs.)

TABLE 21.—*Haemoglobin (Hb.) gm. per* 100 *c.c.*

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	15·36	13·30	—	13·22	13·77	—	11·96	—	—	14·95	14·57
33589....	14·96	14·20	—	13·12	14·28	—	12·13	—	—	—	—
33597....	13·39	12·73	14·28	12·28	11·78	—	13·50	—	—	13·31	13·49
Average	14·68	13·41	—	12·96	13·28	—	12·53	—	—	14·13	14·03

No conclusion can be drawn from the Hb. figures as regards variation. Attention is, however, drawn to the fact that the figures are higher during March, when the animals were still younger. It should be noted that the Hb. figures were usually found abnormally high or low at the beginning of the experiment.

The Hb. varies from 10·87 to 16·54 gm. % with an average of all the figures of 13·7.

The following table indicates the distribution:—

gm. per 100 *c.c.*	*Occurrence.*
Below 11	1
11–12	3
12–13	9
13–14	16
14–15	10
15–16	3
16–17	4

34 % of the determinations lie between 13 and 14 gm. % and 76 % between 12 and 15.

TABLE 22.—*Sugar mg.* % (" *Laked* ").

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	51·3	53·0	—	61·3	48·2	—	59·2	—	—	49·7	45·6
33589....	69·9	63·0	—	63·7	55·8	—	55·7	—	—	—	—
33597....	73·4	59·2	50·5	53·2	51·7	—	45·7	—	—	45·4	51·8
Average	64·8	57·9	—	58·7	51·5	—	51·6	—	—	47·6	48·7

TABLE 23.—*Sugar mg.* % (" *Unlaked* ").

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	46·9	51·1	—	56·7	43·9	—	51·0	—	—	45·7	39·6
33589....	59·7	55·8	—	52·6	43·8	—	51·5	—	—	—	—
33597....	63·5	55·5	39·6	45·1	44·6	—	40·8	—	—	40·8	42·8
Average	56·1	54·2	—	52·8	44·1	—	47·8	—	—	43·2	41·2

" Laked " Filtrates.

Minimum-maximum variation, 42·7–79·4 mg. %.
Average, 57·6 mg. %.

" Unlaked " Filtrates.

Minimum-maximum variation, 35·8–70·9 mg. %.
Average, 50·8 mg. %.
Average difference, 6·8 mg. %.

The following table indicates the distribution:—

" Laked " Filtrates.		*" Unlaked " Filtrates.*	
mg. %.	*Occurrence.*	*mg. %.*	*Occurrence.*
40–45	2	35–40	3
45–50	9	40–45	9
50–55	13	45–50	11
55–60	7	50–55	8
60–65	7	55–60	7
65–70	5	60–65	6
70–75	3	65 and over	2
75–80	2		

24·5 % of the determinations of the " laked " lie between 50 and 55 mg. % and 55 % between 50 and 65, while 24 % of the determinations of the " unlaked " filtrates lie between 45 and 50 and 61 between 40 and 55 mg. %.

Comparison.

The differences of the " laked " and " unlaked " figures vary from 3·3 to 20·6 % with an average of 11·8.

From March to July the blood sugar level fell heavily but was still much higher in comparison with that of Group A (see Graph III).

The tendency of the sugar level to rise towards winter with this given ration, triumphed even over this observed tendency to decrease with age to reach the normal figure of adult sheep. This is even more evident if the average of the different lambs on Tables 22 and 23 are compared. S. 33208 was 10 weeks old at the beginning of the analyses and throughout the blood sugar level increased towards June.

S. 33587 was 5 weeks old and the level remains constant from April to June, from where it decreases again.

S. 33597 was 4 weeks old and the tendency to decrease triumphed wholely over the seasonal inclination towards a rise.

The change in the ration in December, 1932, did not cause a great variation (" Laked " December, 1932, 47·6, January, 1933, 48·7).

The percentage differences in March and June are about equal (13 and 10, see Graph III and c.f. Tables 22 and 23).

Total Nitrogen.

Minimum-maximum variation, 2·4–3·1 gm. N %.

Average, 2·8 gm. N %.

The total nitrogen remains fairly constant. C.f. the tables for individual differences (Tables 18-20).

S. 33597 is exceptionally low (2·66, 2·73, 2·70, 2·94, etc.). S. 33208 being higher (3·066, 3·024, 3·038, etc.).

TABLE 24.—*Non-Protein Nitrogen mg. %. "Laked".*

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	23·6	20·3	—	15·3	15·5	—	18·1	—	—	32·6	26·1
33289....	28·8	24·6	—	17·6	17·8	—	16·8	—	—	—	—
33297....	27·0	25·5	18·3	23·9	16·3	—	18·0	—	—	32·4	27·0
Average	26·5	23·5	—	18·1	16·5	—	17·6	—	—	32·5	26·5

TABLE 25.—*Non-protein Nitrogen mg. % ("Unlaked").*

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	15·8	15·3	—	10·6	10·6	—	11·4	—	—	25·9	18·0
33289....	19·4	15·0	—	10·7	10·3	—	10·7	—	—	—	—
33297....	19·7	15·4	10·2	13·0	9·9	—	9·9	—	—	24·6	19·7
Average	18·1	15·4	—	11·2	10·3	—	10·6	—	—	25·2	18·8

"Laked" Filtrates.

Minimum-maximum range, 14·8–32·4 mg. N %.
Average, 23·0 mg. N %.

"Unlaked" Filtrates.

Minimum-maximum range, 9·3–25· mg. N %.
Average, 15·0 mg. N %.
Average difference, 8·0 mg. N %.

The following table indicates the distribution:—

"Laked" Filtrates.		*"Unlaked" Filtrates.*	
mg. %.	*Occurrence.*	*mg. %.*	*Occurrence.*
Below 15	1	Below 10	4
15–20	16	10–15	23
20–25	13	15–20	9
25–30	9	20–25	9
30–35	7	Above 25	1

"Laked" Filtrates.

35 % of the determinations lie between 15 and 25 mg. N %.
83 % of the determinations lie between 15 and 30 mg. N %.

"Unlaked" Filtrates.

50 % of the determinations lie between 10 and 15 mg. N %.
70 % of the determinations lie between 10 and 20 mg. N %.

Comparison.

The difference between the "laked" and "unlaked" figures varies from 23·2 to 45 % with an average of 35 %, with an average difference of 8·0 in mg. N % (23–15).

From Graph IV it is evident that the percentage differences between the "laked" and "unlaked" figures increase towards the winter since the curves run about parallel (decreasing) and consequently the differences in mg. N % remain about the same.

Note the individual differences of the three lambs, S. 33208 being the lowest (23·6, 20·3, 15·5, etc.), and S. 33297 the highest (27·0, 25·5, 18·3, 23·9) (*vide* Tables 24 and 25).

TABLE 26.—*Urea Nitrogen mg. % ("Laked").*

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	10·2	5·9	—	2·6	2·1	—	3·8	—	—	17·7	8·5
33589....	10·3	5·6	—	3·0	2·4	—	—	—	—	—	—
33597....	9·1	6·2	2·4	5·2	2·2	—	1·9	—	—	15·0	8·0
Average	9·8	5·9	—	3·3	2·2	—	2·8	—	—	16·3	8·5

The "laked" urea nitrogen varies for an undeterminable small quantity (below 1·5 mg. N %) to 17·69 mg. N % with an average of 6·6 mg. N %.

The following table indicates the distribution:—

mg. N %.	*Occurrence.*
Below 1·5	1
1–2	2
2–2	2
3–4	5
4–5	3
5–6	7
6–7	4
Above 7	18

The urea nitrogen decreased gradually from the beginning of the analyses towards winter. In December (1932) the maximum level was reached, but after the withdrawal of the green fodder from the ration it decreased again immediately.

In the case of the "unlaked" the same applies here as in Group A and by comparison of the "laked" and "unlaked" figures on Tables 18-20 it is seen by what quantities the figures differ. The "unlaked" are usually the lowest. In 5 instances the urea nitrogen was too low to be determined (less than 1·5 mg. % N).

The maximum figure obtained for the "unlaked" filtrates is 18·05 mg. N %.

Comparison.

The urea nitrogen curve (see Table 26 and Graph IV) runs approximately parallel with the two non-protein nitrogen curves (*vide* Tables 24 and 25) of Group B. Since the urea nitrogen and non-protein nitrogen curves run parallel, although of course the urea nitrogen is obviously on a much lower level, it is evident that the urea nitrogen percentage of the N.P.N. (both " laked " and " unlaked ") fall heavily, during the period of March to July (see Graph II and Table 26). It again increases to December, 1932, and decreases towards January, 1933. On Graph I two urea nitrogen percentage curves are given (see explanation at the end of Urea N under small heading " Comparison " in Group A).

The " unlaked " urea N percentage curves run much higher than the " laked " because the respective N.P.N. is much less.

The individual differences are not very striking.

TABLE 27.—" *Total* " *Creatinine Nitrogen mg.* % " *Laked* ".

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	1·92	1·70	—	1·84	2·37	—	1·82	—	—	1·90	1·85
33589....	2·17	1·98	—	2·01	2·51	—	2·01	—	—	—	—
33597....	2·06	1·94	2·04	2·16	2·44	—	2·11	—	—	2·23	2·26
Average	2·05	1·88	—	1·96	2·44	—	1·98	—	—	2·06	2·05

TABLE 28.—" *Total* " *Creatinine Nitrogen mg.* % " *Unlaked* ".

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	1·49	1·48	—	1·52	1·90	—	1·45	—	—	1·60	1·41
33589....	1·45	1·45	—	1·75	2·08	—	1·60	—	—	—	—
33597....	1·52	1·52	1·60	1·67	2·18	—	1·49	—	—	2·10	1·95
Average	1·48	1·48	—	1·62	2·06	—	1·55	—	—	1·85	1·68

" *Laked* " *Filtrates.*

Minimum-maximum variation, 1·56–2·85 mg. N %.
Average, 2·04 mg. N %.

" *Unlaked* " *Filtrates.*

Minimum-maximum variation, 1·22–2·35 mg. N %.
Average, 1·59 mg. N %.
Average difference, ·55 mg. N % (laked to unlaked.)

Comparison.

The difference between " laked " and " unlaked " " total " creatinine nitrogen lie between 0 and 40 % (see Table 18, 23.3.32. L 1·56 U. 1·67) and the average difference is 23%.

The curves in mg. N % are not given on Graph IV because they would coincide closely with the respective curves of Group A and have been omitted for the sake of clearness.

The differences in per cent. decrease towards winter (27–17 %).

On Graph II the percentage curves rise considerably, contrary to the urea N percentage curves, of which the " laked " is lower in July than the " T ".C.N. (13·6 %). The " laked " " T ".C.N. curve rises from 8 to 15 % and the " unlaked " from 8 to 20. That the percentage amounts do not increase equally is clear as the curves approach each other (Graph IV) and the non-protein nitrogens run approximately parallel.

Note that the individual differences are in all cases relatively small (On Table 28, S. 33208, 1·92, 1·70, 1·84, etc., S. 33589, 2·17, 1·98, 2·01, etc.).

TABLE 29.—*Uric Acid Nitrogen mg. % " Laked ".*

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	·16	·15	—	·15	·14	—	·18	—	—	·23	·23
33589....	·21	·26	—	·25	·23	—	·25	—	—	—	—
33597....	·25	·23	·22	·21	·23	—	·27	—	—	·43	·32
Average	·20	·22	—	·19	·20	—	·23	—	—	·33	·27

" *Laked Filtrates.*

Minimum-maximum variation, less than ·10–·43 mg. N %.
Average, ·20 mg. N %.

" *Unlaked* " *Filtrates.*

Minimum-maximum variation, less than ·10–·24 mg. N %.
As in Group A no Table of the " unlaked " is given.

Comparison.

In respect of the changeability of the proportions of the " laked " to the " unlaked " figures the same applies here as in Group A, namely, that not only are the figures very changeable, but so is also the relation of the figures of the two filtrates (e.g. Table 18, 14.3.32. L ·23, U. t.l., and 25.4.32, L ·13, U ·13 etc.).

No curves are drawn of the uric acid nitrogen on Graph II and IV because the " laked " one would practically coincide with the given uric acid curve of Group A, and the " unlaked " one has been omitted owing to the incomplete range of figures available, as this constituent in " unlaked " filtrate was frequently below the range of accurate determination. The " laked " curve (in mg. N %) would run about in a straight line on ·2 mg. N % level (Table 29) and the percentage (uric acid nitrogen) of the respective N.P.N. rises from ·8 to 1·2 % from March to July. It is of interest to note the individual low figures encountered, e.g. on Tables 29, S. 33208 never rises above ·23 while the lowest of S. 33597 is ·21 with a maximum of ·43 mg. N %.

TABLE 30.—*Amino-Acid Nitrogen mg. % "Laked".*

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	6·21	6·16	—	5·10	4·74	—	5·15	—	—	6·36	5·93
33589....	7·84	7·78	—	4·67	5·73	—	6·09	—	—	—	—
33597....	7·95	8·06	6·36	6·67	5·69	—	5·93	—	—	7·07	6·93
Average	7·33	7·55	—	5·38	5·39	—	5·72	—	—	6·71	6·43

TABLE 31.—*Amino-Acid Nitrogen mg. % "Unlaked".*

Sheep No.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
33208....	5·07	5·05	—	3·92	3·76	—	4·52	—	—	5·26	5·49
33589....	4·58	5·32	—	2·72	4·26	—	4·49	—	—	—	—
33597....	5·62	5·41	5·04	4·52	3·85	—	4·21	—	—	5·26	5·30
Average	5·03	5·26	—	3·77	3·96	—	4·40	—	—	5·26	5·39

"Laked" Filtrates.

Minimum-maximum variation, 4·67–9·33 mg. N %.
Average, 6·67 mg. N %.

"Unlaked" Filtrates.

Minimum-maximum variation, 2·72–6·73 mg. N %.
4·60 mg. N %.
Average difference, 2·07 mg. N % (laked to unlaked.)

Comparison.

The difference of the "laked" and "unlaked" figures varies from 7·7 % to 58 % with an average of 31 % (2·07 mg.).

The curves in mg. N % have the inclination to approach each other towards winter (c.f. Graph IV and Tables 30 and 31). In March the difference was 2·3 mg. N % and in July only 1·43 at the expense of the "laked" figure. Both curves fall to a minimum in June and rise again after that period, the "laked" figures not approaching, however, the same level in December (1932) as in March, contrary to the rise of the "unlaked" figures (L. 7·3, 7·3, 5·4, 5·4, 6·7, 6·4 and U 5·0, 5·3, 3·8, 4·0, 5·3, 5·4). Note the fall of the percentage curve in December (1932) and the rise in January (1933) which may possibly, if not wholly, be due to the change of rations introduced during this period (Graph II). The difference between the "laked" and "unlaked" figures in March is 31 % and 27 % in July.

On Graph II the percentage curves rise considerably and are fairly parallel, because though the averages fall considerably from March to June (Tables 30 and 31 L. 7·3, 7·3, 5·4 and U. 5·0, 5·3, 3·8 respectively, they do not do so proportionally to the respective non-protein nitrogens.

(*c*) Explanation of Graphs III and IV.

In order to compare the changes of the blood sugar content (both "laked" and "unlaked") in blood of the two Groups A and B, curves have been plotted on the same paper, with the average of all the respective figures of a group per month being recorded as points in mg. glucose per cent. (Graph III). Such curves of all the other constituents (except T.N. and Hb.) of Groups A and B in mg. N % have been recorded on the same graph (Graph IV).

The tables from which these graphs (III and IV) have been plotted together with the same tables of Groups C, D and E and also of the Hb. are all stated in the discussion associated with each separate constituent (Tables 7-17, 21-31, 35-45, 52-62, 68-78).

The averages for each sheep per month are also given in these Tables in order to be able also to note any individual differences between the sheep in a group.

Graph III.

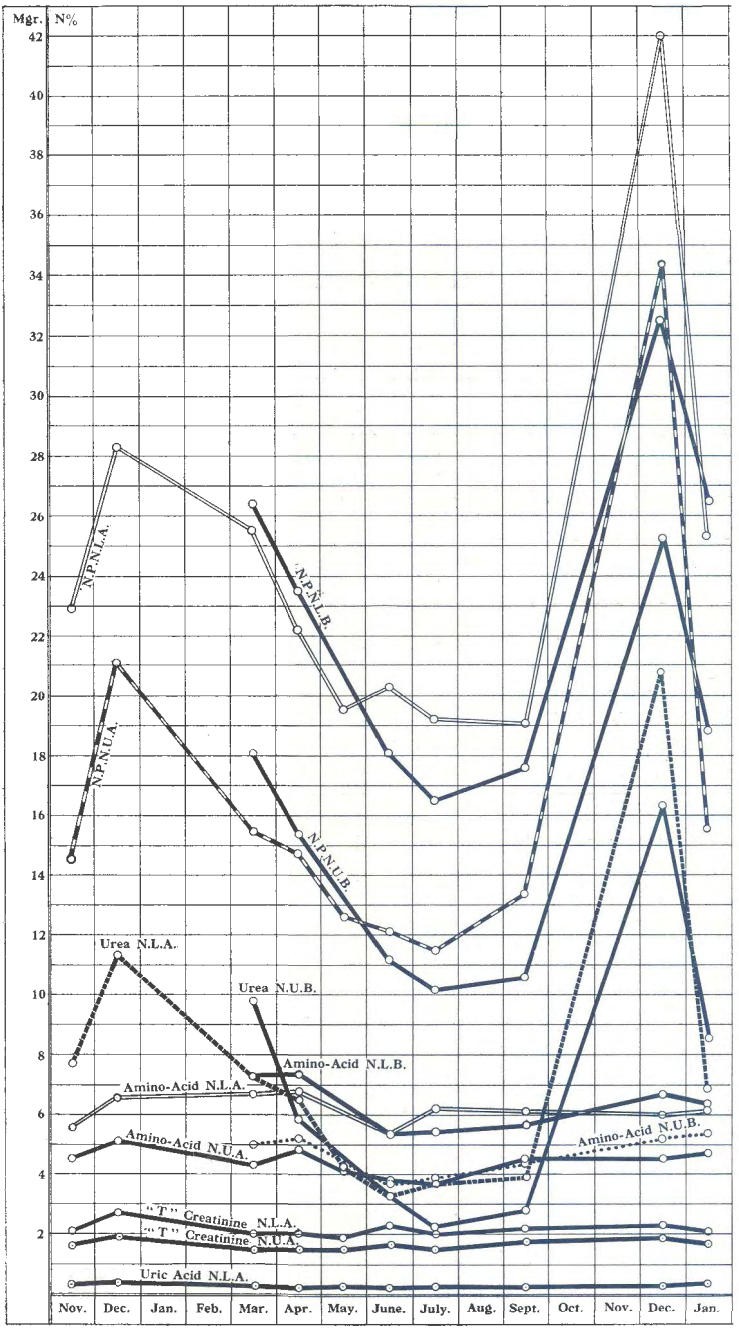
Blood Sugar Curves in mg. %.

Groups A and B.

GRAPH IV.

Nitrogen Partition in mg. N %.

Groups A and B.



(*d*) Groups C, D and E.

As the curves of Groups C, D and E show the same general tendencies as Groups A and B they are not given here. I have, however, for the sake of completeness recorded here the full analytical data gathered. These have been more briefly summarized in order to avoid needless repetition. All the other data, e.g. ranges between which the constituents vary and averages, etc., are also included.

Group C.

Sheep No. 22204, Table 32.
Sheep No. 25140, Table 33.
Sheep No. 25142, Table 34.

TABLE 32.—Sheep 22204.

Date.		11th Nov., 1931.	13th Nov., 1931.	2nd Feb., 1932.	4th Feb., 1932.	22nd Feb., 1932.	26th Feb., 1932.	3rd March, 1932.
Haemoglobin gm. per 100 c.c.		12·42	11·96	15·19	17·18	14·49	—	13·87
Sugar (Glucose) mg. %	L	34·84	43·67	56·18	38·46	48·78	37·04	43·10
	U	31·45	39·22	46·73	23·25	43·57	32·79	39·68
Total N, gm. N %		2·730	2·660	2·954	2·996	3·080	3·075	3·010
Non-protein Nitrogen mg. %	L	21·27	32·08	30·00	35·30	22·22	33·32	25·64
	U	15·15	26·42	24·00	30·92	15·79	27·36	17·65
Coaguable Nitrogen gm.N.%	L	2·709	2·628	2·924	2·961	3·058	3·042	2·984
	U	2·715	2·634	2·930	2·965	3·064	3·048	2·992
Urea mg. N %		5·24	5·25	6·72	20·78	7·73	18·42	7·33
Urea mg. U %	L	11·0	11·0	14·07	43·60	16·20	38·64	15·40
Urea mg. N %		6·79	14·43	16·40	—	7·62	17·27	7·33
Urea mg. U %	U	14·20	30·30	34·49	—	15·96	36·20	15·40
"*Total*" *Creatinine* mg. N %		2·48	2·55	1·97	2·33	2·25	2·23	1·89
"*Total*" *Creatinine* mg. TC %	L	6·7	6·86	5·32	6·26	6·12	6·00	5·14
"*Total*" *Creatinine* mg. N %		1·78	2·19	1·82	2·11	1·75	1·89	1·41
"*Total*" *Creatinine* mg. TC %	U	4·80	5·86	4·90	5·68	4·70	5·14	3·80
Uric Acid mg. N %		·52	·33	·25	·18	·26	·23	·19
Uric Acid mg. UA %	L	1·55	1·0	·74	·53	·78	·68	·57
Uric Acid mg. N %		—	·19	·15	—	·17	·15	·10
Uric Acid mg. UA %	U	—	·57	·44	—	·52	·45	·29
Amino-Acid mg. N %	L	5·00	5·18	6·67	5·38	5·98	6·10	6·36
	U	4·00	4·24	4·35	—	4·38	4·83	5·00
Rest Nitrogen mg. N %	L	8·03	8·77	4·39	6·63	6·00	6·34	9·87
	U	2·58	5·37	1·28	—	1·87	3·22	3·81

History : 24.2.30 Helminthiasis.
18.5.32 Bluetongue.
Weight : 18.12.31—67 lb.
22.1.32—80½ lb.
23.2.32—76 lb.
29.4.32—85 lb.
Discharged : 29.4.32.

TABLE 33.—Sheep 25140.

Date.		12th Nov., 1931.	18th Nov., 1931.	20th Nov., 1931.	5th Feb., 1932.	10th Feb., 1932.	16th Feb., 1932.	19th Feb., 1932.	22nd Feb., 1932.	26th May, 1932.	1st June, 1932.	9th June, 1932.	28th June, 1932.	29th June, 1932.	28th Sept., 1932.	15th Dec., 1932.	24th Jan., 1933.	30th Jan., 1933.
Haemoglobin, gm. per 100 c.c.		11·96	14·28	12·42	17·18	15·42	15·42	14·72	15·42	12·94	16·87	17·18	18·20	14·08	15·98	23·18	21·06	18·57
Sugar, mg. %	L	37·17	56·82	50·50	46·87	45·45	43·48	42·19	38·91	73·56	50·50	42·19	40·49	47·17	43·48	47·37	39·06	38·46
(Glucose)	U	34·48	39·68	44·05	29·41	29·15	33·67	28·25	28·01	60·98	41·32	30·49	32·26	45·05	35·71	33·00	29·24	25·00
Total N, gm. N %		2·688	2·800	2·492	3·168	3·183	3·024	3·094	3·122	2·884	3·136	3·255	3·311	2·884	2·982	3·274	3·304	3·157
Non-Protein Nitrogen, mg. %	L	31·90	26·20	23·06	28·98	25·20	31·90	—	25·98	20·98	24·00	—	—	20·98	19·86	39·46	25·98	26·08
	U	23·06	20·56	16·48	20·98	17·14	21·58	—	15·31	11·32	13·00	—	10·71	12·14	12·93	27·36	14·76	15·79
Coaguable Nitrogen, gm. N %	L	2·656	2·774	2·469	2·139	3·158	2·992	—	3·096	2·861	3·112	—	—	2·863	2·962	3·235	3·278	3·131
	U	2·665	2·779	2·476	2·147	3·166	3·002	—	3·107	2·873	3·123	—	3·300	2·872	2·969	3·247	3·289	3·141
Urea. mg. N %	L	7·12	13·19	11·50	9·93	8·17	15·25	—	7·70	4·33	5·55	—	2·64	1·0	6·69	15·25	4·71	6·15
mg. U %	U	14·98	27·60	24·15	20·80	17·15	32·00	—	16·17	9·10	11·60	—	5·50	2·10	14·07	31·92	9·87	12·81
Urea. mg. N %	U	7·12	13·14	10·77	10·24	8·17	14·88	—	7·47	4·13	4·79	—	2·51	1·13	6·50	13·81	—	6·02
mg. U %		14·95	27·60	22·60	21·50	17·15	31·20	—	15·65	8·70	9·80	—	5·25	2·16	13·65	28·98	—	12·60
"Total" Creatinine. mg. N %	L	—	2·48	2·11	2·23	2·04	2·15	1·93	2·04	1·82	2·15	1·86	2·59	1·82	2·35	2·48	2·11	2·11
mg. TC %		—	6·74	5·68	6·00	5·54	5·76	5·18	5·54	4·90	5·84	5·02	6·96	4·90	6·36	6·74	5·68	5·68
"Total" Creatinine. mg. N %	U	—	1·60	1·45	1·75	1·56	1·82	1·75	1·38	1·41	1·67	1·67	2·23	1·86	1·82	2·01	1·56	1·75
mg. TC %		—	4·36	3·86	4·70	4·16	4·88	4·70	3·78	3·86	4·70	4·50	6·00	5·02	4·80	5·40	4·16	4·70
Uric Acid. mg. N %	L	·31	·37	·25	·27	·24	·32	·32	·25	·25	·28	·29	·33	—	·27	·20	·46	·38
mg UA %		·93	1·12	·76	·82	·73	·97	·95	·75	·75	·85	·87	1·00	—	·80	·59	1·39	1·14
Uric Acid. mg. N %	U	—	—	·12	·14	—	—	·17	·09	·12	·13	·17	·16	—	·09	·10	·15	·11
mg. UA %		—	—	·35	·41	—	—	·52	·26	·37	·40	·50	·49	—	·28	·30	·44	·34
Amino-acid mg. N %	L	7·78	5·71	5·96	5·60	6·67	7·78	7·14	7·00	6·06	5·76	6·06	5·76	5·60	6·63	5·98	7·87	7·00
	U	7·00	4·67	5·28	4·12	4·24	5·60	5·30	5·18	4·11	2·80	2·91	3·73	4·83	3·68	4·27	6·09	5·47
Rest Nitrogen, mg. N %	L	16·69†	4·45	3·24	11·15	8·08	6·40	—	8·99	11·21	10·29	—	—	12·56*	3·91	15·95	10·83	10·44
	U	8·94†	1·15	−1·14	4·73	3·17	− ·77	—	1·19	1·55	3·53	—	2·08	4·32*	·84	6·17	—	2·44

† Includes "Total" Creatinine-N.
* Includes Uric Acid-N.
History: 12 .9.29 Helminthiasis.
Weights: 18.12.31 — 87 lb.
22. 1.32 — 97½ lb.
23. 2.32 — 95½ lb.
29. 4.32 — 107 lb.
26. 5.32 — 106 lb.
22. 7.32 — 110 lb.
24. 8.32 — 116 lb.
29.12.32 — 118 lb.

TABLE 34.—Sheep 25142.

Date.		13th Nov., 1931.	19th Nov., 1931.	25th Nov., 1931.	2nd Feb., 1932.	4th Feb., 1932.	15th Feb., 1932.	18th Feb., 1932.	15th April, 1932.	19th April, 1932.	17th May, 1932.
Haemoglobin, gm. per 100 c.c.		12·94	—	12·79	17·51	18·20	15·19	13·50	12·59	15·42	14·28
Sugar, mg. %	L	47·39	44·64	43·48	47·17	38·46	65·50	47·17	58·85	—	44·84
(Glucose)	U	43·48	35·99	38·46	34·48	33·90	41·84	40·82	53·19	—	34·48
Total N, gm. N %		2·870	2·968	2·814	3·099	3·052	3·030	3·010	3·010	3·234	3·108
Non-Protein N, mg. %	L	—	—	—	28·70	31·58	25·86	30·30	21·82	28·98	24·40
	U	—	—	—	21·58	23·06	17·65	22·98	15·55	16·94	13·45
Coagulable Nitrogen, gm. N %.	L	—	—	—	3·070	3·020	3·004	2·980	2·988	3·205	3·084
	U	—	—	—	3·077	3·029	3·012	2·987	2·994	3·217	3·095
Urea. mg. N %	L	—	—	—	14·50	17·69	8·56	12·36	5·85	9·93	5·55
Urea. mg. U %	L	—	—	—	30·45	37·00	17·90	25·90	12·25	20·80	11·60
Urea. mg. N %	U	—	—	—	14·50	16·70	9·00	12·70	5·66	9·69	6·19
Urea. mg. U %	U	—	—	—	30·45	35·07	18·90	26·67	11·80	20·30	12·95
mg. N %	L	2·89	2·66	2·40	2·36	2·33	2·33	2·04	2·04	1·49	1·67
mg. TC %	L	7·78	7·20	6·54	6·40	6·00	6·26	5·54	5·54	4·00	4·50
"Total" Creatinine mg. N %	U	2·19	2·23	1·82	1·89	2·01	1·93	1·93	1·65	1·3	1·78
"Total" Creatinine mg. TC %	U	5·86	6·00	4·90	5·14	5·40	5·24	5·14	4·22	3·40	4·80
mg. N %	L	—	—	—	·25	·30	·42	·34	·28	·24	·29
mg. UA %	L	—	—	—	·75	·89	1·25	1·02	·84	·72	·86
Uric Acid mg. N %	U	—	—	—	·15	—	—	·17	·15	—	·11
Uric Acid mg. UA %	U	—	—	—	·44	—	—	·52	·44	—	·33
Amino Acid, mg. N %	L	6·22	—	6·36	6·09	4·67	7·37	6·36	7·45	7·00	6·73
	U	—	—	4·67	3·50	3·89	5·38	4·67	4·67	4·83	4·00
Rest Nitrogen, mg. N %	L	—	—	—	5·50	6·69	7·18	9·20	6·20	10·32	10·16
	U	—	—	—	1·58	0·46	1·44	3·51	3·51	1·08	1·37

History: 24. 2.30 Helminthiasis.
Weight: 18.12.31 — 93 lb.
22. 1.32 — 102½ lb.
23. 2.32 — 100 lb
29. 4.32 — 115 lb.
29. 4.32 — discharged.

GROUP C. (*Three six-tooth ewes*).

TABLE 35.—*Haemoglobin gm. per* 100 *c.c.*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	12·2	—	—	15·6	13·9	—	—	—	—	—	—	—	—	—	—
25140	12·9	—	—	15·6	—	—	12·9	16·6	—	—	16·0	—	—	23·2	19·8
25142	12·9	—	—	16·1	—	14·0	14·3	—	—	—	—	—	—	—	—
Av...	12·7	—	—	17·8	13·9	140·	14·0	16·6	—	—	16·0	—	—	23·2	19·8

Minimum-maximum variation in gm. per 100 c.c. 11·96–23·18.
Average, 16·7.

The following table indicates the distribution:—

gm. per 100 *c.c.*	*No. of determinations.*
10–11	0
11–12	2
12–13	6
13–14	2
14–15	5
15–16	7
16–17	1
17–18	3
18 and more	5

21 % of the determinations lie between 15 and 16 gm. per 100 c.c. and 50 % between 13 and 15 gm. per 100 c.c.

TABLE 36.—*Sugar mg.* % (" *Laked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	39·2	—	—	45·1	43·1	—	—	—	—	—	—	—	—	—	—
25140	48·2	—	—	43·4	—	—	73·5	45·1	—	—	43·4	—	—	47·4	38·8
25142	45·2	—	—	49·6	—	58·8	44·8	—	—	—	—	—	—	—	—
Av...	44·8	—	—	45·8	43·1	58·8	60·7	45·1	—	—	43·4	—	—	47·4	38·8

TABLE 37.—*Sugar mg.* % (" *Unlaked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	35·3	—	—	36·6	39·7	—	—	—	—	—	—	—	—	—	—
25140	39·4	—	—	27·7	—	—	61·0	37·3	—	—	35·7	—	—	33·0	27·1
25142	39.3	—	—	37·8	—	53·2	34·5	—	—	—	—	—	—	—	—
Av...	38·3	—	—	34·3	39·7	53·2	47·7	37·3	—	—	35·7	—	—	33·0	27·1

" *Laked* " *Filtrates.*

Minimum-maximum variation, 34–74 mg. %.
Average, 46·2 mg. %.

" *Unlaked* " *Filtrates.*

Minimum-maximum variation, 23–61 mg. %.
Average, 36·8 mg. %.
Average difference, 9·4 mg. % (laked to unlaked.)

The following Table indicates the distribution:—

" Laked " Filtrates.		*" Unlaked " Filtrates.*	
mg. %.	*Occurrence.*	*mg. %.*	*Occurrence.*
25–30	0	20–25	1
30–35	1	25–30	6
35–40	7	30–35	10
40–45	10	35–40	6
45–50	8	40–45	6
50–55	2	45–50	2
55–60	3	50–55	1
60–65	0	55–60	0
65–70	1	60–65	1
70–75	1		

" Laked " Filtrates.

30 % of the determinations lie between 40 and 45 mg. %.
76 % of the determinations lie between 35 and 50 mg. %.

" Unlaked " Filtrates.

30 % of the determinations lie between 30 and 35 mg. %.
85 % of the determinations lie between 25 and 45 mg. %.

The differences between " laked " and " unlaked " vary between 40 % and 9%.

The average difference is 20 %.

Total Nitrogen.

Minimum-maximum variation, gm. N % 2·4–3·3.
Average, 2·9 gm. N %.

TABLE 38.—*Non-Protein Nitrogen mg. % (" Laked ").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	22·2	—	—	30·6	25·6	—	—	—	—	—	—	—	—	—	—
25140	27·1	—	—	28·0	—	—	21·0	22·5	—	—	19·9	—	—	39·5	26·0
25142	—	—	—	29·1	—	25·4	24·4	—	—	—	—	—	—	—	—
Av...	26·9	—	—	29·9	25·6	25·4	22·7	22·5	—	—	19·9	—	—	39·5	26·0

TABLE 39.—*Non-Protein Nitrogen mg. % (" Unlaked ").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	20·8	—	—	24·5	17·6	—	—	—	—	—	—	—	—	—	—
25140	20·0	—	—	18·7	—	—	11·3	11·9	—	—	12·9	—	—	27·4	15·3
25142	—	—	—	21·3	—	16·2	13·4	—	—	—	—	—	—	—	—
Av...	20·3	—	—	21·5	17·6	16·2	12·9	11·9	—	—	12·9	—	—	27·4	15·3

" Laked ".

Minimum-maximum variation, 19·86–39·06 mg. N %.
Average, 26 mg N %.

" Unlaked ".

Minimum-maximum variation 10·7–27·36 mg. N %.
Average, 19 mg. N %.
Average difference, 7·0 mg. N % (laked to unlaked.)

The following Table indicates the distribution:—

" Laked " Filtrates.		*" Unlaked " Filtrates.*	
mg. N %.	*Occurrence.*	*mg. N %*	*Occurrence.*
Below 20	1	10–14	7
20–25	8	15–20	10
25–30	10	20–25	11
30–35	8	more than 25	1
more than 35	1		

" Laked " Filtrates.

36 % of the determinations lie between 25 and 30 mg. N %.
64 % of the determinations lie between 25 and 35 mg. N %.

" Unlaked " Filtrates.

34 % of the determinations lie between 15 and 20 mg. N %.
73 % of the determinations lie between 10 and 25 mg. N %.

The percentage differences of the " laked " and " unlaked " figures vary from 12 to 48 with an average of 27%.

TABLE 40.—*Urea Nitrogen mg. %* (*" Laked "*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	10·2	—	—	15·9	7·3	—	—	—	—	—	—	—	—	—	—
25140	10·6	—	—	10·3	—	—	4·3	3·0	—	—	6·7	—	—	15·3	5·4
25142	—	—	—	13·3	—	7·9	5·5	—	—	—	—	—	—	—	—
Av...	10·4	—	—	13·1	7·3	7·9	4·9	3·0	—	—	6·7	—	—	15·3	5·4

" Laked ".

Minimum-maximum variation, below ·15–20.78 mg. N %.
Average, 9·83 mg. N %.

" Unlaked ".

Minimum-maximum variation, below ·15–17·24 mg. N %.

The following Table indicates the distribution:—

Below 5	3
5–6	4
6–7	2
7–8	4
8–9	2
9–10	2
above 10	11

36 % of the determinations of the " laked " filtrates lie between 5 and 8 mg. N %.

TABLE 41.—*" Total " Creatinine Nitrogen mg. % (" T ".C.N.) " Laked ".*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	2·51	—	—	2·19	1·89	—	—	—	—	—	—	—	—	—	—
25140	2·30	—	—	2·04	—	—	1·82	2·10	—	—	2·35	—	—	2·48	2·11
25142	2·65	—	—	2·24	—	1·76	1·67	—	—	—	—	—	—	—	—
Av..	2·51	—	—	2·19	1·89	1·76	1·74	2·10	—	—	2·35	—	—	2·48	2·11

TABLE 42.—*" Total " Creatinine Nitrogen mg. % (" T ".C.N.) " Unlaked ".*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	1·98	—	—	1·89	1·41	—	—	—	—	—	—	—	—	—	—
25140	1·52	—	—	1·65	—	—	1·41	1·88	—	—	1·82	—	—	2·01	1·66
25142	2·08	—	—	1·94	—	1·45	1·78	—	—	—	—	—	—	—	—
Av...	1·89	—	—	1·79	1·41	1·45	1·59	1·88	—	—	1·82	—	—	2·01	1·66

" Laked " Filtrates.

Minimum-maximum variation, 1·49–2·66 mg. N %.
Average, 2·17 mg. N %.

" Unlaked " Filtrates.

Minimum-maximum variation, 1·34–2·23 mg. N %.
Average, 1·79 mg. N %.
Average difference, 0·38 mg. N %.

The differences between " laked " and " unlaked " " T ".C.N. vary from 7·5 to 35·5 %, with an average of 17·5 %.

TABLE 43.—*Uric Acid Nitrogen mg. % (" Laked ").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	·42	—	—	·23	·19	—	—	—	—	—	—	—	—	—	—
25140	·31	—	—	·28	—	—	·25	·22	—	—	·27	—	—	·20	·42
25142	—	—	—	·33	—	·26	·29	—	—	—	—	—	—	—	—
Av...	·35	—	—	·28	—	·26	·27	·22	—	—	·27	—	—	·20	·42

" Laked " Filtrates.

Minimum-maximum variation, less than ·10–·52 mg. N %.
Average, 0·29 mg. N %.

" Unlaked " Filtrates.

Minimum-maximum variation, less than ·10–·19 mg. N %.

TABLE 44.—*Amino-Acid Nitrogen mg. %* (*"Laked"*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	5·09	—	—	6·03	6·36	—	—	—	—	—	—	—	—	—	—
25140	6·48	—	—	6·84	—	—	6·06	5·79	—	—	6·63	—	—	5·98	7·43
25142	6·29	—	—	6·12	—	7·22	6·73	—	—	—	—	—	—	—	—
Av...	6·03	—	—	6·37	6·36	7·22	6·39	5·79	—	—	6·63	—	—	5·98	7·43

TABLE 45.—*Amino-Acid Nitrogen mg. %* (*"Unlaked"*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
22204	4·12	—	—	4·52	5·00	—	—	—	—	—	—	—	—	—	—
25140	5·65	—	—	4·89	—	—	4·11	3·57	—	—	3·68	—	—	4·27	5·78
25142	4·67	—	—	4·36	—	4·75	4·00	—	—	—	—	—	—	—	—
Av...	4·97	—	—	4·54	5·00	4·75	4·05	3·57	—	—	3·68	—	—	4·27	5·78

"Laked" Filtrates.

Minimum-maximum variation, 5–7·87 mg. N %.
Average, 6·37 mg. N %.

"Unlaked" Filtrates.

Minimum-maximum variation, 2·80–7·00 mg. N %.

Average, 4·57 mg. N %.

Average difference, 1·80 mg. N %.

The differences of the "laked" and "unlaked" figures vary from 10 to 52 % with an average of 28 %.

GROUP D.

Sheep No. 24312, Table 46.
,, No. 29151, Table 47.
,, No. 29468, Table 48.
,, No. 29471, Table 49.
,, No. 29496, Table 50.
,, No. 29503, Table 51.

TABLE 46.—Sheep 24312.

Date		12th Nov., 1931.	18th Jan., 1931.	20th Nov., 1931.	5th Feb., 1932.	8th Feb., 1932.	10th Feb., 1932.	16th Feb., 1932.	19th Feb., 1932.	11th March, 1932.	18th May, 1932.	20th May, 1932.	30th June, 1932.	4th July, 1932.	28th Sept., 1932.	19th Dec., 1932.	26th Jan., 1933.	31st Jan., 1933.
Haemoglobin, gm. per 100 c.c.		11·39	10·99	12·13	15·98	14·72	14·49	12·79	12·42	13·68	15·98	17·51	—	15·19	13·87	15·19	14·08	14·28
Sugar, mg. % (Glucose)	L	47·85	42·37	53·19	—	—	—	48·08	43·48	44·44	48·31	43·67	47·39	40·00	40·98	40·82	57·47	41·66
	U	35·99	37·31	42·55	—	—	—	36·50	36·10	32·26	40·16	32·57	44·44	33·78	37·74	31·15	50·25	26·74
Total-N., gm. N %		2·562	2·520	2·542	3·024	3·001	3·028	2·847	2·751	3·052	3·066	3·234	—	3·129	2·968	3·038	2·786	2·590
Non-Protein Nitrogen, mg. %	L	20·27	32·60	30·00	38·96	31·58	30·00	34·28	—	26·08	21·88	20·92	24·50	27·26	21·43	33·16	30·16	34·48
	U	16·21	24·20	23·54	28·04	24·00	23·08	24·80	26·32	19·86	14·71	15·79	11·95	17·75	15·46	23·54	23·54	25·00
Coaguable Nitrogen, gm. N %	L	2·542	2·487	2·512	2·985	2·969	2·998	2·813	—	3·026	3·044	3·213	—	3·102	2·947	3·065	2·756	2·556
	U	2·546	2·496	2·518	2·996	2·977	3·005	2·822	2·725	3·032	3·051	3·218	—	3·111	2·953	3·014	2·763	2·565
Urea																		
mg. N %	L	5·21	16·62	17·19	16·55	11·27	11·58	16·10	—	10·49	4·63	7·33	6·02	9·00	6·43	13·49	6·46	11·20
mg. U %		10·92	34·90	36·10	34·70	23·60	24·20	33·81	—	21·90	9·70	15·40	12·60	18·90	13·44	28·35	13·50	21·42
mg. N %	U	5·06	15·66	17·34	15·53	15·67	12·25	17·69	14·63	11·12	4·71	3·44	9·06	7·00	6·32	13·76	6·69	11·87
mg. U %		10·60	32·85	36·40	32·60	32·85	25·70	37·00	30·70	23·35	9·87	7·20	18·90	14·70	13·23	28·98	14·07	24·99
"Total" Creatinine																		
mg. N %	L	—	2·48	2·11	2·23	2·33	2·23	2·12	1·98	2·10	2·10	2·01	2·40	2·23	2·23	2·36	2·11	2·48
mg. TC %		—	6·70	5·68	6·00	6·26	6·00	5·76	5·34	5·68	5·68	5·40	6·54	6·00	6·00	6·36	5·68	6·74
mg. N %	U	—	2·23	1·89	1·78	1·75	1·82	2·41	1·61	1·71	1·41	1·00	1·45	1·82	1·71	1·82	1·56	1·82
mg. TC %		—	6·00	5·14	4·80	4·70	4·90	6·54	4·36	4·60	3·80	4·70	3·86	4·90	4·60	4·90	4·16	4·90
Uric acid																		
mg. N %	L	·29	·33	·26	·28	·30	·24	·39	·32	·31	·28	·28	—	·41	·32	·38	·30	·36
mg. UA %		·86	1·00	·78	·83	·91	·73	1·19	·95	·93	·85	·84	—	1·23	·97	1·14	·90	1·07
mg. N %	U	—	·17	·15	·14	—	—	—	·18	·16	·18	·14	—	·18	·11	·10	·10	·12
mg. UA %		—	·52	·46	·43	—	—	—	·53	·47	·53	·42	—	·53	·32	·31	·30	·35
Amino Acid, mg. N %	L	7·14	6·09	5·83	7·00	6·36	6·93	6·67	6·73	8·24	7·37	6·45	5·56	6·42	7·37	7·95	7·21	6·48
	U	7·54	5·00	5·18	4·24	5·64	4·86	5·83	5·93	4·76	5·13	3·68	3·87	4·93	4·16	6·36	5·83	4·73
Rest Nitrogen, mg. N %	L	7·63*	7·10	4·61	12·90	11·32	9·02	9·00	—	4·94	7·50	4·85	10·52†	9·20	5·08	7·98	4·08	13·96
	U	3·61*	1·14	0·87	6·35	0·94	4·15	— ·73	3·97	2·11	3·28	7·53	−2·37	3·82	3·16	0·51	9·36	6·46

* Includes "Total" Creatinine-N. † Includes Uric Acid-N.

History: Born at Onderstepoort, 1.7.29.
12.9.32, Helminthiasis.

Weights: 18.12.32 — 61 lb.
22. 1.32 — 75 lb.
23. 2.32 — 75 lb.
29. 4.32 — 85 lb.
26. 5.32 — 88 lb.
22. 7.32 — 90 lb.
24. 8.32 — 95 lb.
29.12.32 — 98 lb.

TABLE 47.—Sheep 29151.

Date		25th Nov., 1931.	27th Nov., 1931.	8th Feb., 1932.	10th Feb., 1932.	25th Feb., 1932.	29th Feb., 1932.	3rd March, 1932.	26th May, 1932.	2nd June, 1932.	6th June, 1932.	23rd June, 1932.	4th July, 1932.	28th Sept., 1932.	19th Dec., 1932.	26th Jan., 1933.	31st Jan., 1933.
Haemoglobin, gm. per 100 c.c.		9·32	13·68	12·42	11·67	10·35	12·13	11·53	11·67	12·42	12·13	12·79	12·13	12·28	12·94	12·42	13·31
Sugar, mg. % (Glucose)	L	43·48	50·00	—	44·25	48·78	55·87	51·55	56·50	53·76	61·35	60·61	62·11	65·79	47·85	45·66	40·32
	U	40·65	41·66	—	36·36	41·66	44·84	43·48	49·26	43·29	49·26	51·02	51·28	63·29	37·04	38·91	30·96
Total-N., gm. N %		2·401	2·562	2·800	2·730	2·590	2·646	2·674	2·660	2·716	2·688	2·646	2·422	2·555	2·786	2·534	2·576
Non-Protein Nitrogen, mg. %	L	33·32	39·72	28·56	26·20	41·66	28·32	28·04	22·40	20·70	27·14	24·28	20·13	15·87	34·08	23·36	25·00
	U	27·26	33·88	20·84	18·75	33·72	21·82	19·23	12·40	12·10	21·82	12·30	12·50	9·43	27·78	14·42	12·87
Coagulable Nitrogen, gm. N %	L	2·368	2·524	2·771	2·704	2·549	2·618	2·646	2·638	2·695	2·661	2·622	2·402	2·539	2·752	2·511	2·551
	U	2·374	2·530	2·779	2·712	2·556	2·624	2·655	2·648	2·704	2·666	2·634	2·409	2·546	2·759	2·520	2·563
Urea mg. N %	L	16·40	21·48	10·24	8·66	18·61	10·36	6·49	4·06	3·00	7·70	3·65	4·56	4·13	15·66	3·76	5·99
Urea mg. U %	L	34·44	45·00	21·48	18·10	39·06	21·70	13·50	8·50	6·30	16·17	7·60	9·50	8·61	32·97	7·98	12·60
Urea mg. N %	U	16·78	21·87	11·50	8·75	20·51	9·81	7·26	4·33	3·00	7·70	1·85	4·71	4·40	16·70	4 26	5·99
Urea mg. U %	U	35·20	45·80	24·15	18·30	43·05	20·58	15·20	9·03	6·30	16·17	3·80	9·87	9·24	35·07	9·03	12·60
"Total" Creatinine mg. N %	L	2·32	2·32	2·23	2·05	2·23	2·05	2·10	1·90	2·28	2·28	2·49	2·28	2·04	2·59	2·40	2·25
"Total" Creatinine mg. TC %	L	6·26	6·26	6·00	5·54	6·00	5·54	5·68	5·14	6·16	6·16	6·74	6·16	5·50	6·96	6·54	6·12
"Total" Creatinine mg. N %	U	1·78	1·82	1·85	1·71	1·82	1·90	1·67	1·51	2·01	2·11	2·04	1·67	1·56	2·23	1·64	2·11
"Total" Creatinine mg. TC %	U	4·80	4·90	4·96	4·60	4·90	5·14	4·50	4·08	5·40	5·70	5·50	4·50	4·16	6·00	4·80	5·68
Uric Acid mg. N %	L	·35	·30	·30	·22	·29	·32	·23	·21	·21	·18	·20	·31	·25	·25	·25	·31
Uric Acid mg. UA %	L	1·05	·89	·89	·66	·88	·95	·68	·63	·59	·55	·60	·94	·76	·76	·74	·94
Uric Acid mg. N %	U	·19	—	—	—	·17	·17	·07	·12	·09	·10	·09	·20	·08	·09	·11	·10
Uric Acid mg. UA %	U	·57	—	—	—	·50	·52	·22	·36	·26	·31	·27	·59	·25	·27	·34	·30
Amino Acid mg. N %	L	7·00	6·22	6·36	5·96	6·90	7·78	6·83	6·01	6·25	6·48	7·18	5·36	5·74	7·70	6·30	5·74
Amino Acid mg. N %	U	5·83	5·28	5·83	4·12	5·18	4·83	5·07	4·02	4·52	4·64	4·36	4·12	3·68	5·98	5·26	4·79
Rest Nitrogen, mg. N %	L	7·25	9·40	9·43	9·31	13·63	7·81	12·39	10·22	8·97	10·50	10·76	7·62	3·71	7·38	10·65	10·71
	U	2·68	4·91	1·66	5·17	6·04	2·52	5·16	2·42	2·48	7·27	3·66	1·80	— ·29	1·78	3·15	— ·12

History: Born at Onderstepoort, 6.9.30.
26. 9.30 Helminthiasis.

Weights:
18.12.32 — 49½ lb
22. 1.32 — 60 lb.
23. 2.32 — 59½ lb.
29. 4.32 — 65 lb.
26. 5.32 — 65 lb.
22. 7.32 — 75 lb.
24. 8.32 — 77 lb.
29.12.32 — 74 lb.

TABLE 48.—Sheep 29468.

Date		19th Nov., 1931.	25th Nov., 1931.	2nd Feb., 1932.	4th Feb., 1932.	15ht Feb., 1932.	18th Feb., 1932.	18th May, 1932.	20th May, 1932.	27th May, 1932.	2nd June, 1932.	6th June, 1932.	5th July, 1932.	7th July, 1932.	28th Sept., 1932.	19th Dec., 1932.	26th Jan., 1933.	31st Jan., 1933.
Haemoglobin, gm. per 100 c.c.		12·42	9·81	11·82	11·24	11·67	10·35	13·31	13·31	10·99	13·31	10·87	11·39	11·14	12·59	11·39	14·08	14·28
Sugar, mg. % (Glucose)	L	40·00	48·54	58·82	47·17	59·88	54·05	54·05	50·25	56·50	59·58	55·55	57·47	58·14	52·91	51·02	45·66	80·65
	U	35·99	42·01	45·45	38·31	52·63	50·50	47·39	37·21	48·31	52·08	45·25	47·39	47·17	49·50	47·62	38·91	63·29
Total-N., gm. N %		2·442	2·352	2·660	2·534	2·618	2·499	2·821	2·709	2·548	2·625	2·583	2·520	2·646	2·660	2·688	2·786	2·618
Non-Protein N., mg. %	L	43·24	36·58	34·48	35·30	28·32	38·96	15·95	18·41	18·63	23·72	20·00	20·00	15·87	26·52	33·32	30·16	32·96
	U	35·30	27·90	27·52	28·98	21·20	28·56	10·07	14·28	12·05	16·39	11·53	13·04	11·03	15·23	25·96	23·54	23·36
Urea mg. N %	L	—	18·05	17·61	20·62	13·60	17·69	3·16	3·00	2·00	8·34	3·00	2·84	t.l.	9·20	17·87	6·46	9·81
Urea mg. U %	L	—	37·85	36·96	43·30	28·56	37·00	6·60	6·30	4·20	17·50	6·30	5·96	t.l.	19·32	37·59	13·50	20·58
Urea mg. N %	U	—	18·30	20·27	21·22	13·81	17·69	3·16	3·44	3·26	8·34	3·00	2·71	t.l.	5·78	16·40	6·69	11·50
Urea mg. U %	U	—	38·43	42·50	44·56	29·00	37·10	6·60	7·20	6·80	17·50	6·30	5·75	t.l.	12·18	34·44	14·07	24·15
mg. N %	L	2·40	2·48	2·04	2·23	2·55	2·01	1·86	2·04	2·23	2·11	1·82	2·01	2·23	2·36	2·36	2·11	2·25
mg. TC %	L	6·54	6·86	5·54	6·00	6·86	5·54	5·02	5·50	5·50	6·00	5·68	4·90	6·00	6·36	6·36	5·68	6·12
"Total" Creatinine mg. N %	U	2·23	1·82	1·56	1·89	2·15	1·89	1·49	1·56	1·75	1·75	1·45	2·11	1·45	2·01	2·01	1·56	1·97
Creatinine mg. TC %	U	6·00	4·90	4·16	5·14	5·76	5·14	4·00	4·24	4·70	4·70	3·86	5·68	3·92	5·40	5·40	4·16	5·32
mg. N %	L	·20	·26	·33	·20	·30	·25	·20	·22	·18	·18	·17	·27	·24	·28	·19	·30	·29
mg. UA %	L	·59	·78	·99	·59	·90	·76	·62	·65	·54	·53	·51	·80	·73	·86	·57	·90	·87
Uric Acid mg. N %	U	—	·11	·12	·09	—	·16	·17	·14	·10	·08	·10	·21	·14	·08	·10	·10	·12
Uric Acid mg. U A %	U	—	·32	·36	·26	—	·49	·50	·42	·31	·25	·29	·62	·42	·24	·31	·30	·37
Amino Acid mg. N	L	5·60	6·22	6·73	5·18	6·67	5·83	6·76	6·09	7·00	6·09	5·18	4·93	5·30	6·14	7·14	7·21	5·46
	U	5·38	5·00	4·24	3·78	5·11	5·00	5·00	4·61	4·98	3·89	3·71	3·33	4·35	3·59	5·98	5·83	4·66
Rest Nitrogen, mg. N %	L	—	9·57	7·77	7·07	5·20	13·18	3·97	7·06	7·22	7·00	9·83	9·95	8·10	8·54	4·60	14·08	15·15
	U	—	2·67	1·33	2·00	0·13	3·82	0·25	4·53	1·96	2·33	3·27	4·64	5·09	3·77	·47	9·36	5·11

History : Born at Bestersput, 19.5.30.
30. 1.31, Haematoporphyrin experiment.

Weights : 18.12.31 — 63 lb.
22. 1.32 — 72 lb.
23. 2.32 — 75 lb.
29. 4.32 — 85 lb.
26. 5.32 — 85 lb.
22. 7.32 — 89 lb.
24. 8.32 — 90 lb.
29.12.32 — 92 lb.

TABLE 49.—Sheep 29471.

Date		18th Nov., 1931.	20th Nov., 1931.	5th Feb., 1932.	10th Feb., 1932.	16th Feb., 1932.	19th Feb., 1932.	22nd March, 1932.	12th May, 1932.
Haemoglobin, gm. per 100 c.c.		—	10·97	12·79	13·12	11·53	11·67	12·42	13·50
Sugar, mg. % (Glucose)	L	51·28	47·62	39·84	44·05	50·00	46·30	45·45	47·62
	U	—	45·45	32·26	37·74	42·37	42·37	40·32	35·09
Total-N., gm. N %		—	2·352	2·716	2·807	2·730	2·716	2·772	2·884
Non-Protein N., mg. %	L	26·78	28·08	33·32	24·00	31·74	31·42	28·98	20·00
	U	—	23·54	29·12	15·46	23·16	20·28	20·00	12·93
Coagulable N., gm. N %	L	—	2·323	2·683	2·783	2·698	2·685	2·743	2·864
	U	—	3·328	2·687	2·792	2·707	2·696	2·752	2·872
Urea mg. N %	L	13·04	17·12	12·79	8·22	15·00	—	8·30	4·88
Urea mg. U %	L	27·38	35·95	26·70	17·30	31·50	—	17·43	10·20
Urea mg. N %	U	—	17·19	13·29	8·26	15·40	15·98	8·26	4·88
Urea mg. U %	U	—	36·00	27·80	17·30	32·34	33·50	17·30	10·20
"Total" Creatinine mg. N %	L	2·48	2·36	2·23	2·15	2·33	2·25	2·15	2·04
"Total" Creatinine mg. TC %	L	6·70	6·36	6·00	5·76	6·26	6·12	5·78	5·50
"Total" Creatinine mg. N %	U	—	1·75	1·67	1·67	1·89	1·75	1·78	1·60
"Total" Creatinine mg. TC %	U	—	4·70	4·50	4·70	5·14	4·72	4·80	4·32
Uric Acid mg. N %	L	·25	·08	·25	·21	·32	·33	·24	·25
Uric Acid mg. UA %	L	·76	·26	·76	·62	·97	1·00	·71	·74
Uric Acid mg. N %	U	—	·09	—	—	—	·19	·09	·08
Uric Acid mg. UA %	U	—	·27	—	—	—	·58	·28	·26
Amino Acid, mg. N %	L	5·28	5·82	5·49	6·09	6·60	6·36	7·00	6·25
Amino Acid, mg. N %	U	—	5·18	3·78	4·12	5·18	4·67	5·00	4·23
Rest Nitrogen, mg. N %	L	5·73	2·69	14·27	7·33	7·49	—	11·29	6·58
Rest Nitrogen, mg. N %	U	—	— ·67	10·38	3·08	·69	— ·23	4·87	2·14

History: Born at Bestersput, 19.5.30.
18. 5.32, Bluetongue.
24.12.30, Helminthiasis.
Weights: 18.12.31 — 49 lb.
22. 1.32 — 66 lb.
23. 2.32 — 65 lb.
29. 4.32 — 76 lb
Discharged, 29.4.32.

TABLE 50.—Sheep 29496.

Date		27th Nov., 1931.	1st Dec., 1931.	15th Feb., 1932.	18th Feb., 1932.	22nd Feb., 1932.	26th Feb., 1932.	2nd March, 1932.	13th May, 1932.	18th May, 1932.	20th May, 1932.	23rd June, 1932.	30th June, 1932.	29th Sept., 1932.	19th Dec., 1932.	27th Jan., 1933.	31st Jan., 1933.
Haemoglobin, gm. per 100 c.c		15·42	11·67	13·12	13·31	13·31	12·59	15·19	16·54	15·19	15·19	16·29	14·08	16·87	14·29	14·49	16·87
Sugar, mg. % (Glucose)	L	47·62	51·55	48·78	54·95	48·08	48·08	47·85	42·92	42·01	44·64	46·87	44·64	45·45	46·73	51·81	42·55
	U	40·65	46·51	38·91	40·65	46·30	39·68	42·01	29·67	30·30	33·11	38·31	35·97	29·41	32·26	34·60	31·95
Total-N., gm. N %		2·226	2·576	2·912	2·807	2·891	2·835	2·982	3·038	3·052	3·066	3·017	3·031	3·080	2·982	2·926	2·940
Non-Protein Nitrogen, mg. %	L	29·12	27·23	24·00	36·82	28·84	35·50	25·00	25·00	18·18	27·40	24·20	23·42	27·02	30·00	25·64	34·08
	U	20·20	20·51	15·63	23·13	20·98	25·86	15·80	12·35	12·73	10·35	13·04	11·86	15·08	21·16	12·77	22·22
Coaguable N., gm. N %	L	2·197	2·549	2·888	2·870	2·862	2·799	2·957	3·013	3·034	3·039	2·992	3·008	3·053	2·952	2·900	2·906
	U	2·206	2·555	2·997	2·884	2·870	2·809	2·966	3·026	3·039	3·056	3·004	3·019	3·065	2·961	2·913	2·918
Urea mg. U %	L	10·83	9·15	7·26	15·12	11·99	—	7·47	4·13	3·16	7·33	3·54	4·26	8·17	11·82	8·09	10·88
Urea mg. N %	L	22·7	19·20	15·20	31·71	25·00	—	15·68	8·65	6·60	15·33	7·40	8·95	17·22	24·78	17·01	22·89
Urea mg. N %	U	10·77	9·00	7·20	15·74	10·63	15·66	9·47	4·26	3·00	8·00	1·63	5·89	7·89	11·50	5·66	10·90
Urea mg. U %	U	22·50	18·90	15·12	33·00	22·30	32·80	19·80	8·90	6·30	16·80	3·40	12·30	16·59	24·15	11·76	22·89
mg. N %	L	2·32	2·54	2·41	2·14	2·14	2·04	1·90	1·90	2·10	2·04	2·41	2·23	2·23	2·29	2·04	2·23
mg. TC %	L	6·26	6·86	6·54	5·76	5·76	5·50	5·14	5·14	5·68	5·50	6·54	6·00	6·00	6·60	5·50	6·00
"Total" Creatinine mg. N %	U	1·82	2·15	1·78	1·57	1·78	1·67	1·51	1·37	1·60	1·38	—	1·90	1·67	1·86	1·56	1·82
"Total" Creatinine mg. TC %	U	4·90	5·76	4·80	4·24	4·80	4·50	4·08	3·66	4·32	3·72	—	5·14	4·50	5·02	4·08	4·90
Uric Acid mg. N %	L	·27	·35	·33	·30	·36	·36	·43	·27	·23	·31	·22	—	·27	·36	·41	·39
Uric Acid mg. UA %	L	·80	1·05	1·00	·89	1·10	1·07	1·28	·81	·71	·93	·67	—	·82	1·07	1·23	1·19
Uric Acid mg. N %	U	—	·24	—	·16	·17	·21	·19	—	·16	·14	·08	—	·09	·08	·14	·17
Uric Acid mg. UA %	U	—	·73	—	·47	·50	·63	·58	—	·49	·43	·23	—	·27	·25	·42	·50
Amino Acid, mg. N %	L	5·28	8·24	7·00	7·22	8·64	7·78	7·78	6·60	7·78	6·48	6·67	5·58	5·30	7·86	7·14	5·93
	U	4·67	6·36	6·09	5·74	5·18	5·18	5·60	4·38	5·43	4·00	4·46	3·33	4·67	6·25	5·83	5·30
Rest Nitrogen, mg. N %	L	10·52	6·95	7·00	12·04	5·71	—	7·42	12·10	4·91	11·24	11·36	11·35*	11·05	6·67	7·96	14·65
	U	2·94	2·76	·56	— ·08	3·22	3·14	— ·97	2·34	2·54	—3·17	6·67†	·74*	·76	·47	— ·42	5·03

* Includes Uric Acid-*N*. † Includes "Total" Creatinine-*N*.

History: Born at Bestersput, 19.5.30.
30. 1.31, Haematoporphyrin experiment.

Weights: 18.12.31 — 53 lb.
22. 1.32 — 69 lb.
23. 2.32 — 70 lb.
29. 4.32 — 80 lb.
26. 5.32 — 80 lb.
22. 7.32 — 85 lb.
24. 8.32 — 85 lb.
29.12.32 — 90 lb.

TABLE 51.—Sheep 29503.

Date		25th Nov., 1931.	27th Nov., 1931.	5th Feb., 1932.	8th Feb., 1932.	22nd Feb., 1932.	26th Feb., 1932.	2nd March, 1932.	11th March, 1932.	26th May, 1932.	2nd June, 1932.	6th June, 1932.	7th July, 1932.	8th July, 1932.	28th Sept., 1932.	21st Dec., 1932.	27th Jan., 1933.	1st Feb., 1933.
Haemoglobin, gm. per 100 c.c.		10·87	17·51	14·72	14·72	14·72	13·68	14·28	14·95	13·87	15·19	13·31	15·19	14·49	13·68	13·87	13·68	15·42
Sugar, mg. % (Glucose)	L	—	45·25	—	—	50·76	44·44	46·73	48·08	40·82	44·44	52·08	46·95	47·62	45·05	37·88	40·16	38·91
	U	—	42·92	—	—	45·45	36·50	40·32	40·00	33·56	35·71	44·05	40·65	44·64	39·22	30·49	32·68	27·77
Total-N., gm. N %		2·506	2·618	3·010	3·010	3·052	3·080	3·059	2·975	2·982	2·926	2·877	3·024	2·996	2·828	2·758	2·744	2·835
Non-Protein Nitrogen, mg. %	L	31·58	31·90	25·64	27·26	23·24	30·92	18·75	28·16	20·98	20·38	23·42	14·71	14·56	21·14	32·26	25·25	25·32
	U	24·58	26·78	20·42	20·34	16·21	24·28	14·28	17·24	12·00	13·21	13·00	10·75	8·75	12·05	26·64	13·83	16·58
Coaguable Nitrogen, gm. N %	L	2·474	2·586	2·984	2·983	3·029	3·049	3·040	2·947	2·961	2·906	2·854	3·009	2·981	2·807	2·726	2·719	2·810
	U	2·481	2·591	2·990	2·990	3·036	3·056	3·045	2·958	2·970	2·913	2·864	3·013	2·987	2·816	2·732	2·730	2·818
Urea mg. N %	L	15·88	15·53	10·90	10·11	8·52	12·51	5·89	11·82	4·40	3·76	4·92	t.l.	2·84	4·88	18·05	5·25	9·26
Urea mg. U %	L	33·30	32·55	22·89	21·21	17·85	26·25	12·30	24·80	9·24	7·87	10·30	t.l.	5·90	10·29	38·00	10·92	19·53
Urea mg. N %	U	15·81	15·95	10·90	13·60	8·56	13·29	5·89	10·77	4·00	3·55	4·68	t.l.	—	4·88	18·42	5·25	9·00
Urea mg. U %	U	33·20	33·50	2·89	28·56	17·95	27·80	12·30	22·56	8·40	7·40	9·80	t.l.	—	10·29	38·64	10·92	18·90
"Total" Creatinine mg. N %	L	2·05	2·30	2·14	2·32	2·14	2·41	1·71	2·10	2·04	2·10	1·97	2·36	1·82	2·23	2·40	2·29	2·29
"Total" Creatinine mg. TC %	L	5·54	6·26	5·76	6·26	5·76	6·54	4·60	5·68	5·50	5·68	5·32	6·36	4·90	6·00	6·54	6·16	6·16
"Total" Creatinine mg. N %	U	1·78	1·78	1·49	1·67	1·67	1·90	1·49	1·41	1·52	1·75	1·52	1·55	1·45	2·01	2·16	1·87	2·11
"Total" Creatinine mg. TC %	U	4·80	4·80	4·00	4·50	4·50	5·14	4·00	3·80	4·08	4·70	4·08	4·16	3·86	5·40	5·68	5·14	5·68
Uric Acid mg. N %	L	·26	·28	·21	·23	·30	·30	·35	·25	·24	·18	·17	·29	·27	·26	·33	·31	·34
Uric Acid mg. UA %	L	·78	·84	·63	·69	·90	·91	1·05	·75	·71	·55	·52	·86	·80	·78	1·00	·94	1·03
Uric Acid mg. N %	U	·17	—	—	—	·18	·18	·24	·09	·10	·10	·09	·14	·13	·08	—	·10	·10
Uric Acid mg. UA %	U	·50	—	—	—	·53	·53	·71	·27	·30	·29	·28	·42	·38	·25	—	·30	·31
Amino Acid, mg. N %	L	5·60	5·60	5·00	5·83	7·14	7·00	6·36	7·00	5·83	6·42	5·53	5·26	4·24	5·60	5·83	6·36	4·86
	U	4·83	4·52	3·68	4·96	4·24	4·83	5·83	4·40	4·36	3·98	4·58	3·68	3·04	3·68	5·43	4·21	4·16
Rest Nitrogen, mg. N %	L	7·79	7·19	8·39	8·77	5·14	8·70	4·44	6·99	8·47	7·92	10·83	6·80	5·39	8·17	4·65	11·04	8·57
	U	1·99	4·53	4·35	0·11	1·56	4·08	0·83	0·57	2·02	3·83	2·13	5·38	3·95	1·40	— ·31	2·40	1·21

History: Born at Besterspu, 19.5.30.
7. 1.31, Haematoporphyrin experiment.

Weights: 18.12.31 — 50 lb.
22. 1.32 — 66 lb.
29. 4.32 — 70 lb.
26. 5.32 — 72 lb.
22. 7.32 — 80 lb.
24. 8.32 — 79½ lb.
29.12.32 — 78 lb.

GROUP D. (*Six ewe lambs.*)

TABLE 52.—*Haemoglobin gm. per* 100 *c.c.*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	11·2	—	—	14·1	13·7	—	16·7	—	15·2	—	13·9	—	—	15·2	14·2
29151	11·5	—	—	11·6	11·5	—	11·7	12·5	12·1	—	12·3	—	—	12·9	12·9
29468	11·1	—	—	11·3	—	—	12·5	12·1	11·3	—	12·6	—	—	11·4	14·2
29471	10·9	—	—	12·3	12·4	—	13·5	—	—	—	—	—	—	—	—
29496	15·4	11·7	—	13·1	15·2	—	15·6	15·2	—	—	16·9	—	—	14·3	15·7
29503	14·2	—	—	14·5	14·6	—	13·9	14·3	14·8	—	13·7	—	—	13·9	14·6
Av...	11·9	—	—	12·8	13·3	—	13·8	12·9	13·3	—	13·9	—	—	13·5	14·3

Minimum-maximum variation gm. per 100 c.c., 9·32–17·51. Average, 13·24.

The following table indicates the distribution:—

gm. per 100 *c.c.*	*No. of determinations.*
9–10	2
10–11	7
11–12	13
12–13	16
13–14	18
14–15	14
15–16	11
16–17	4
17–18	2

21 % of the determinations lie between 13 and 14 gm. % and 55 between 12 and 15 gm. %.

TABLE 53.—*Sugar mg.* % (" *Laked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	47·8	—	—	45·8	44·4	—	46·0	47·4	40·0	—	41·0	—	—	40·8	44·6
29151	46·7	—	—	49·6	51·6	—	56·5	58·6	62·1	—	65·8	—	—	47·9	43·0
29468	44·3	—	—	55·0	—	—	53·6	57·6	57·8	—	52·9	—	—	51·0	63·2
29471	49·3	—	—	45·1	45·5	—	47·6	—	—	—	—	—	—	—	—
29496	47·6	51·6	—	49·9	47 9	—	43·2	45·8	—	—	45·5	—	—	46·7	47·2
29503	39·9	—	—	47·6	47·4	—	40·8	48·3	47·3	—	45·1	—	—	37·9	39·5
Av...	46·4	—	—	49·2	47·4	—	47·9	52·7	52·0	—	50·0	—	—	44·9	45·5

TABLE 54.—*Sugar mg.* % (" *Unlaked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
23412	38·6	—	—	36·3	32·36	—	36·4	44·4	33·8	—	37·7	—	—	31·2	38·5
29151	41·2	—	—	40·9	43·5	—	49·3	47·9	57·3	—	63·3	—	—	37·0	38·9
29468	39·0	—	—	46·7	—	—	44·3	48·7	47·3	—	49·5	—	—	47·6	51·1
29471	45·5	—	—	38·7	40·3	—	35·1	—	—	—	—	—	—	—	—
29496	43·6	—	—	41·4	42·0	—	31·0	37·1	—	—	29·4	—	—	32·3	33·3
29503	39·3	—	—	40·9	40·2	—	33·6	39·9	42·6	—	39·2	—	—	30·5	30·2
Av...	40·6	—	—	41·3	39·6	—	38·2	43·9	42·7	—	43·8	—	—	35·7	37·6

" Laked " Filtrates.

Minimum-maximum variation, 34–81 mg. %.
Average, 48·4 mg. %.

" Unlaked " Filtrates.

Minimum-maximum variation, 29–63 mg. %.
Average, 38·0 mg. %.
Average difference, 10·4 mg. %.

The following table indicates the distribution:—

" Laked " Filtrates.		*" Unlaked " Filtrates.*	
mg. %.	*Occurrence.*	*mg. %.*	*Occurrence.*
30–35	1	25–30	4
35–40	3	30–35	15
40–45	22	35–40	21
45–50	28	40–45	22
50–55	16	45–50	14
55–60	10	50–55	6
60–65	3	more than 55	2
80–85	1		

" Laked " Filtrates.

33 % of the determinations lie between 45 and 50 mg. %.
78 % of the determinations lie between 40 and 55 mg. %.

" Unlaked " Filtrates.

25 % of the determinations lie between 40 and 45 mg. %.
70 % of the determinations lie between 30 and 45 mg. %.

The differences between " laked " and " unlaked " vary from 4 to 26 %, with the average 20 %.

Total Nitrogen.

Minimum-maximum variation gm. N % 2·4–3·2.
Average, 2·75 gm. N %.

TABLE 55.—*Non-Protein Nitrogen mg. %* (*" Laked "*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	27·6	—	—	33·7	26·1	—	21·4	24·5	27·3	—	21·4	—	—	33·2	33·6
29151	36·5	—	—	31·2	28·0	—	22·4	24·0	20·1	—	15·9	—	—	34·1	24·2
29468	59·9	—	—	34·3	—	—	17·7	21·9	17·9	—	26·5	—	—	33·3	31·6
29471	27·4	—	—	30·1	28·9	—	20·0	—	—	—	—	—	—	—	—
29496	29·1	27·2	—	31·3	25·0	—	23·5	23·8	—	—	27·0	—	—	30·0	29·9
29503	31·7	—	—	26·8	23·5	—	20·9	21·9	14·6	—	21·1	—	—	32·3	25·3
Av...	31·9	—	—	31·2	25·8	—	20·7	23·2	18·8	—	22·4	—	—	32·6	28·9

TABLE 56.—*Non-Protein Nitrogen mg. %* (*" Unlaked "*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	21·3	—	—	25·4	19·9	—	15·3	11·9	17·8	—	15·5	—	—	23·5	24·3
29151	30·6	—	—	23·8	19·2	—	12·4	15·3	12·5	—	9·4	—	—	27·8	13·7
29468	31·5	—	—	26·6	—	—	12·1	13·9	12·0	—	15·2	—	—	25·9	23·5
29471	23·5	—	—	22·0	20·0	—	12·9	—	—	—	—	—	—	—	—
29496	20·4	—	—	21·4	15·8	—	12·6	12·5	—	—	15·1	—	—	21·1	17·5
29503	25·7	—	—	20·3	15·8	—	12·0	13·1	10·8	—	12·1	—	—	26·6	15·2
Av...	25·1	—	—	23·5	17·3	—	13·8	13·7	13·0	—	13·5	—	—	25·0	18·8

" Laked " Filtrates.

Minimum-maximum variation, 14·6–43·2 mg. N %.
Average, 26 mg. N %.

" Unlaked " Filtrates.

Minimum-maximum variation, 8·6–35·3 mg. N %.
Average, 18 mg. N %.
Average difference, 8 mg. N %.

The following table indicates the distribution:—

" Laked " Filtrates.		*" Unlaked " Filtrates.*	
mg. %.	*Occurrence.*	*mg. %.*	*Occurrence.*
below 15	2	below 15	27
20–20	7	15–20	14
20–25	22	20–25	23
25–30	26	above 25	16
30–35	24		

" Laked " Filtrates.

32 % of the determinations lie between 25 and 30 mg. N %.
62 % of the determinations lie between 25 and 35 mg. N %.

" Unlaked " Filtrates.

32 % of the determinations lie below 15 mg. N %.

The percentage differences of the " laked " and " unlaked " figures vary between 16 % to 48 % with an average of 31 %.

TABLE 57.—*Urea Nitrogen mg. %* (*" Laked "*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	13·0	—	—	13·9	10·5	—	6·0	6·0	9·0	—	6·4	—	—	13·5	8·8
29151	18·9	—	—	11·9	6·5	—	4·1	4·6	4·6	—	4·1	—	—	15·7	4·9
29468	18·1	—	—	17·2	—	—	2·7	5·7	1·4	—	9·2	—	—	17·9	8·1
29471	15·1	—	—	12·0	8·3	—	4·9	—	—	—	—	—	—	—	—
29496	10·0	—	—	11·5	—	—	4·8	3·9	—	—	8·2	—	—	11·8	9·5
29503	15·7	—	—	10·5	8·9	—	4·4	4·3	1·4	—	4·9	—	—	18·1	7·3
AV...	14·5	—	—	12·9	8·4	—	4·7	4·8	3·2	—	6·6	—	—	15·4	7·7

" Laked " Filtrates.

Minimum-maximum variation, below 1·0–21·48 mg. N %.
Average, 9·28 mg. N %.

" Unlaked " Filtrates.

Minimum-maximum variation, below 1·0–21·87 mg. N %
Average, 9·28 mg N %.

The following table indicates the distribution of the " laked ":—

Below 4	12
4– 5	10
5– 6	4
6– 7	5
7– 8	5
8– 9	6
9–10	5
10–11	6
above 11	31

20 % of the determinations lie between 6 and 9 mg. N %.

TABLE 58.—*"Total Creatinine Nitrogen mg. % ("Laked")*.

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	2·3	—	—	2·2	2·1	—	2·1	2·4	2·2	—	2·2	—	—	2·4	2·3
29151	2·3	—	—	2·1	2·1	—	1·9	2·4	2·3	—	2·0	—	—	2·6	2·3
29468	2·4	—	—	2·2	—	—	2·0	1·9	2·1	—	2·4	—	—	2·4	2·2
29471	2·4	—	—	2·2	2·2	—	2·0	—	—	—	—	—	—	—	—
29496	2·3	2·5	—	2·2	1·9	—	2·0	2·3	—	—	2·2	—	—	2·3	2·3
29503	2·2	—	—	2·3	1·9	—	2·0	2·0	2·1	—	2·2	—	—	2·4	2·3
Av...	2·3	—	—	2·2	2·0	—	2·0	2·2	2·2	—	2·2	—	—	2·4	2·3

TABLE 59.—*"Total" Creatinine Nitrogen mg. % ("Unlaked")*.

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	2·1	—	—	1·9	1·7	—	1·2	1·5	1·8	—	1·7	—	—	1·8	1·7
29151	1·8	—	—	1·8	1·7	—	1·5	2·1	1·7	—	1·6	—	—	2·2	1·9
29468	2·0	—	—	1·9	—	—	1·6	1·6	1·8	—	2·0	—	—	2·0	1·8
29471	1·8	—	—	1·7	1·8	—	1·6	—	—	—	—	—	—	—	—
29496	2·0	—	—	1·7	1·5	—	1·5	1·9	—	—	1·7	—	—	1·9	1·7
29503	1·8	—	—	1·7	1·5	—	1·5	1·6	1·5	—	2·0	—	—	2·1	2·0
Av...	1·9	—	—	1·8	1·6	—	1·5	1·8	1·7	—	2·0	—	—	2·0	1·8

"Laked" Filtrates.

Minimum-maximum variation, 1·71–2·55 mg. N %.
Average, 2·22 mg. N %.

"Unlaked" Filtrates.

Minimum-maximum variation, 1·0–2·41 mg. N %.
Average, 1·75 mg. N %.
Average difference, 0·47 mg. N %.

The differences between "laked" and "unlaked" "T".C.N. vary from 5 % to 34 %, with an average of 21 %.

TABLE 60.—*Uric-Acid Nitrogen mg. % ("Laked")*.

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	·29	—	—	·31	·31	—	·28	—	·41	—	·32	—	—	·38	·33
28151	·32	—	—	·28	·23	—	·21	·19	·31	—	·25	—	—	·25	·28
29468	·25	—	—	·27	—	—	·20	·18	·25	—	·28	—	—	·19	·30
29471	·16	—	—	·28	·24	—	·25	—	—	—	—	—	—	—	—
29496	·27	·35	—	·34	·43	—	·27	·22	—	—	·27	—	—	·36	·40
29503	·27	—	—	·26	·30	—	·24	·18	·28	—	·26	—	—	·33	·32
Av...	·26	—	—	·28	·30	—	·24	·17	·30	—	·28	—	—	·30	·33

"Laked" Filtrates.

Minimum-maximum variation, below ·10–·52 mg. N %.
Average, 0·36 mg. N %.

"Unlaked" Filtrates.

Minimum-maximum variation, below ·10–·24 mg. N %.

TABLE 61.—*Amino-Acid Nitrogen mg. %* (*" Laked "*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	6·4	—	—	6·7	8·2	—	6·9	5·6	6·4	—	7·4	—	—	7·9	6·8
29151	6·6	—	—	6·8	6·8	—	6·0	6·6	5·4	—	5·7	—	—	7·7	6·0
29468	5·9	—	—	6·1	—	—	6·6	8·4	5·1	—	6·1	—	—	7·1	6·3
29471	5·6	—	—	6·1	7·0	—	6·3	—	—	—	—	—	—	—	—
29496	6·8	8·2	—	7·7	7·8	—	7·9	6·1	—	—	5·3	—	—	7·9	6·5
29503	5·6	—	—	6·2	6·7	—	5·8	5·9	4·9	—	5·6	—	—	5·8	5·6
Av...	6·2	—	—	6·2	7·2	—	6·6	6·1	5·3	—	6·0	—	—	7·3	6·3

TABLE 62.—*Amino-Acid Nitrogen mg. %* (*" Unlaked "*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
24312	5·9	—	—	5·3	4·8	—	4·4	3·9	4·9	—	4·2	—	—	6·4	5·3
29151	5·6	—	—	4·9	5·1	—	4·0	4·5	4·1	—	3·7	—	—	5·9	5·0
29468	5·2	—	—	4·5	—	—	4·9	3·8	3·8	—	3·6	—	—	5·9	5·2
29471	5·2	—	—	4·4	5·0	—	4·2	—	—	—	—	—	—	—	—
29496	4·7	6·4	—	5·6	5·6	—	4·6	3·9	—	—	4·7	—	—	6·3	5·6
29503	4·7	—	—	4·4	5·1	—	4·4	4·3	3·4	—	3·7	—	—	5·4	4·2
Av...	5·3	—	—	4·9	5·1	—	4·5	4·1	3·9	—	3·9	—	—	6·0	5·1

" Laked " Filtrates.

Minimum-maximum variation, 4·86–7·14 mg. N %.
Average, 6·39 mg. N %.

" Unlaked " Filtrates.

Minimum-maximum variation, 3·04–7·54* mg. N %.
Average, 4·80 mg. N %.
Average difference, 1·59 mg. N %.

The differences of the " laked " and " unlaked " figures vary from 0* to 43 %, with the average of 28·5 %.

GROUP E.

Sheep No. 28437, Table 63.
,, No. 31662, Table 64.
,, No. 31742, Table 65.
,, No. 31905, Table 66.
,, No. 32176, Table 67.

* Vide table 46, 12th November, 1931.

TABLE 63.—Sheep 28437.

Date.		29th Oct., 1931.	3rd Nov., 1931.	2nd Dec., 1931.	3rd Dec., 1931.	4th March, 1932.	17th March, 1932.	31st March, 1932.	29th April, 1932.	3rd May, 1932.	6th May, 1932.	30th June, 1932.	5th July, 1932.	12th July, 1932.	30th Sept., 1932.	21st Dec., 1932.	27th Jan., 1933.	1st Feb., 1933.
Haemoglobin, gm., per 100 c.c.		12·28	13·77	11·67	11·96	11·67	14·08	11·96	17·18	14·95	13·87	14·28	15·98	14·28	10·14	12·28	11·24	13·31
Sugar, mg. %	L	36·76	38·61	52·63	52·08	45·25	39·68	41·15	84·03	51·55	52·63	52·63	43·10	49·50	44·25	43·10	48·54	38·91
(Glucose)	U	33·0	31·65	43·10	41·66	42·65	35·09	36·10	76·34	47·74	42·37	45·05	37·45	37·88	37·17	42·01	40·98	27·77
Total N., gm. N %		2·422	2·625	2·590	2·534	2·702	2·884	2·758	3·122	3·045	2·828	2·968	3·080	2·940	2·688	2·695	2·492	2·835
Non-Protein Nitrogen. mg. %	L	—	15·95	28·98	24·20	24·00	26·20	24·40	17·97	26·42	21·06	22·72	20·42	18·69	17·44	27·66	16·86	25·32
	U	12·42	10·53	23·08	17·44	—	16·13	15·31	11·77	19·23	14·16	13·39	13·39	11·53	11·45	21·58	10·91	15·68
Coagulable Nitrogen. gm. N %	L	—	2·609	2·561	2·510	2·678	2·858	2·734	3·104	3·019	2·807	2·945	3·060	2·921	2·671	2·667	2·475	2·810
	U	2·410	2·614	2·567	2·517	—	2·868	2·743	3·110	3·026	2·814	2·955	3·067	2·928	2·677	2·673	2·481	2·818
Urea. mg. N %	L	4·44	4·00	16·47	8·90	8·13	8·24	9·20	5·15	7·70	6·40	6·26	3·00	2·71	4·88	13·76	3·00	8·14
mg. U %		9·30	8·40	34·50	18·69	17·01	17·50	19·32	10·71	16·17	13·44	13·10	6·30	5·67	10·29	28·98	6·30	17·01
mg. N %	U	5·06	4·08	17·19	9·25	—	8·52	9·20	5·55	7·26	6·30	5·25	1·25	2·57	4·71	14·10	3·00	6·94
mg. U %		10·60	8·40	36·00	19·40	—	17·80	19·32	11·60	15·20	13·23	11·00	2·60	5·35	9·87	29·61	6·30	14·49
mg. N %	L	2·01	2·04	2·41	2·32	2·01	2·15	2·05	2·01	1·67	1·90	2·35	2·14	2·23	2·11	1·82	1·71	2·29
mg. TC %		5·42	5·54	6·54	6·26	5·40	4·80	5·54	5·40	4·50	5·14	6·36	5·78	6·00	5·68	4·90	4·60	6·16
"Total" Creatinine. mg. N %	U	1·82	1·86	1·85	1·82	1·52	1·34	1·72	1·41	1·25	1·64	1·75	1·67	1·78	1·67	1·54	1·44	2·11
mg. TC %		4·90	5·02	4·96	4·90	4·08	3·60	4·65	3·80	3·36	4·40	4·70	4·50	4·80	4·50	4·16	3·86	5·68
mg. N %	L	—	·26	·32	·27	·16	·30	·20	·28	·26	·22	—	·28	·24	·19	·39	·25	·34
mg. UA %		—	·77	·95	·82	·48	·91	·59	·83	·77	·65	—	·84	·73	·56	1·18	·75	1·03
Uric acid. mg. N %	UU	—	—	—	·15	—	·15	·11	·19	·13	·14	—	·20	·10	·08	·16	·14	·10
mg. UA %		—	—	—	·46	—	·44	·33	·57	·38	·42	—	·59	·29	·24	·48	·42	·30
Amino acid, mg. N %	L	7·11	7·18	5·83	6·09	7·00	5·83	5·79	7·14	7·37	6·09	5·38	5·83	5·36	6·54	6·80	5·93	4·86
	U	5·38	5·38	5·18	5·18	—	4·67	5·18	4·86	4·75	5·18	3·85	4·35	3·50	4·35	5·79	5·38	4·16
Rest Nitrogen, mg. N %	L	—	—	3·95	6·62	6·70	9·58	7·16	3·39	9·42	6·45	—	9·17	8·15	3·72	3·89	5·97	9·69
	U	·16	—	− 1·14	1·04	—	1·45	− ·90	− ·24	5·84	·90	—	5·92	3·58	·64	− 1·01	·95	3·27

History: 24.5.30 — Bluetongue.
27.6.30 — Helminthiasis.
25.9.30 — Feeding experiment.

Weights: 18.12.31 — 117 lb.
22. 1.32 — 136 lb.
23. 2.32 — 118½ lb.
29. 4.32 — 128 lb.
26. 5.32 — 130 lb.
22. 7.32 — 135 lb.
24. 8.32 — 137 lb.
29.12.32 — 135 lb.

TABLE 64.—Sheep 31662.

Date.		28th Oct., 1931,	30th Oct., 1931.	26th Nov., 1931.	3rd Dec., 1931.	25th Feb., 1931.	29th Feb., 1932.	3rd March, 1932.	29th April, 1932.	3rd May, 1932.	6th May, 1932.
Haemoglobin, gm., per 100 c.c.		12·42	12·79	12·94	12·28	12·13	14·49	13·31	15·42	15·19	14·28
Sugar, mg. %. (Glucose)	L	34·48	45·05	46·73	45·87	51·55	51·55	46·08	53·19	48·08	51·02
	U	33·33	48·54	49·32	36·00	33·67	37·07	40·00	41·84	38·31	40·82
Total N., gm. N %		2·681	2·660	2·786	2·744	2·856	3·080	2·926	2·954	3·150	3·024
Non-Protein-N., mg. %.	L	26·52	—	34·48	26·32	33·16	30·92	34·68	25·10	27·02	24·90
	U	20·00	—	26·52	20·56	22·98	22·30	26·20	16·13	18·99	17·24
Coaguable N., gm. N %.	L	2·654	—	2·752	2·718	2·823	3·050	2·891	2·929	3·123	2·999
	U	2·661	—	2·759	2·724	2·833	3·058	2·900	2·938	3·131	3·007
Urea.	L										
mg. N %		9·20	6·27	14·33	11·25	12·03	9·58	10·90	10·77	5·66	7·33
mg. U %		19·32	13·18	33·03	23·60	25·20	20·00	22·89	22·60	11·86	15·40
Urea.	U										
mg. N %		9·82	5·94	14·63	11·00	12·42	9·42	10·17	10·97	5·49	7·33
mg. U %		20·60	12·40	33·70	23·10	26·04	19·74	21·30	22·95	11·40	15·33
" *Total* "-*Creatinine.*	L										
mg. N %		2·66	2·32	2·25	2·80	2·18	2·23	2·10	2·16	1·82	2·66
mg. TC %		7·20	6·26	6·12	7·58	5·86	6·00	5·68	5·84	4·90	7·20
" *Total* "-*Creatinine.*	U										
mg. N %		2·23	1·78	1·82	2·09	1·75	1·90	1·55	1·44	1·29	·93
mg. TC %		6·00	4·80	4·90	5·64	4·70	5·14	4·16	3·86	3·48	2·50
Uric acid.	L										
mg. N %		—	·38	·40	·38	·34	·36	·23	·32	·31	·29
mg. UA %		—	1·14	1·19	1·14	1·02	1·08	·70	·96	·91	·87
Uric acid.	U										
mg. N %		—	—	·19	—	·14	·16	·09	·18	·13	·14
mg. UA %		—	—	·57	—	·42	·47	·27	·55	·38	·41
Amino acid, mg. N %.	L	7·49	6·67	6·36	6·67	8·24	8·48	8·24	5·98	8·24	8·24
	U	6·36	4·79	4·79	5·00	5·74	5·18	5·60	4·00	4·38	5·83
Rest Nitrogen, mg. N %.	L	7·17*	—	11·14	5·22	10·73	10·27	13·21	5·87	10·99	6·27
	U	1·59*	—	5·09	2·47	2·93	5·64	8·79	— ·46	7·70	3·01

* Includes Uric Acid N.

History : 10. 6.31 — Bluetongue.

Weights : 18.12.31 — 78 lb.
22. 1.32 — 98½ lb.
23. 2.32 — 95 lb.
29. 4.32 — 97 lb.
29. 4.32 — Discharged.

TABLE 65.—Sheep 31742.

Date.		29th Oct., 1931.	3rd Nov., 1931.	2nd Dec., 1931.	10th Dec., 1931.	4th March, 1932.	22nd March, 1932.	31st March, 1932.	12th May, 1932.	1st June, 1932.	8th July, 1932.	12th July, 1932.	30th Sept., 1932.	22nd Dec., 1933.	25th Jan., 1933.	1st Feb., 1933.
Haemoglobin, gm. per 100 c.c.		13·12	16·29	13·31	15·19	13·50	15·42	14·28	14·72	15·19	17·18	15·42	12·59	17·51	17·51	12·13
Sugar, mg. % (Glucose)	L	40·82	—	43·48	37·17	51·28	41·84	39·84	39·06	41·84	48·08	43·48	51·28	50·00	50·76	54·64
	U	32·79	—	27·47	53·34	40·98	31·25	29·15	29·33	33·00	37·88	29·41	39·22	32·26	36·90	35·97
Total N., gm. N %		2·926	2·968	2·968	2·814	2·940	2·171	3·094	2·996	3·136	2·982	3·108	2·919	3·080	2·954	2·772
Non-Protein Nitrogen, mg. %	L	—	20·54	28·98	29·42	—	23·62	26·32	25·64	26·78	17·85	18·75	20·70	37·50	24·50	23·42
	U	12·50	12·50	23·72	21·72	—	15·00	13·10	14·71	15·29	9·43	10·10	16·66	27·02	15·39	14·42
Coagulable Nitrogen, gm. N %.	L	—	2·947	2·939	2·785	—	3·147	3·068	2·970	3·109	2·964	3·089	2·898	3·053	2·930	2·749
	U	2·913	2·955	2·944	2·792	—	3·156	3·081	2·981	3·121	2·974	3·098	2·902	3·063	2·939	2·758
Urea. mg. N %	L	5·45	7·16	11·50	13·14	6·55	5·60	6·40	5·55	6·81	2·78	3·00	6·07	19·62	5·10	5·54
Urea. mg. U %	L	11·40	15·00	24·15	27·60	13·70	11·76	13·44	11·60	14·30	5·80	6·30	12·81	41·16	10·71	11·55
Urea. mg. N %	U	5·06	7·70	10·70	13·29	7·00	4·85	6·55	5·71	6·81	t. 1	3·66	5·53	19·84	5·21	8·01
Urea. mg. U %	U	10·60	16·17	22·47	27·90	14·70	10·20	13·70	11·97	14·28	—	7·60	11·55	41·58	10·92	16·80
"*Total*" *creatinine.* mg. N %	L	1·97	2·23	2·36	2·81	1·90	1·97	2·23	1·97	2·35	2·11	2·17	2·01	2·36	2·23	2·44
"*Total*" *creatinine.* mg. TC %	L	5·32	6·00	6·40	7·58	5·14	5·32	6·05	5·32	6·36	5·68	5·68	6·40	6·36	6·00	6·54
"*Total*" *creatinine.* mg. N %	U	1·90	1·82	2·01	2·32	1·57	1·45	1·78	1·60	1·78	1·38	1·75	1·56	2·04	1·52	1·75
"*Total*" *creatinine.* mg. TC %	U	5·14	4·90	5·40	6·26	4·24	3·88	4·80	4·32	4·80	3·72	4·70	4·16	5·50	4·16	4·70
Uric acid. mg. N %	L	—	·30	·38	·34	·25	·24	·24	·24	·27	·33	·30	·22	·44	·36	·39
Uric acid. mg. UA %	L	—	·91	1·14	·102	·74	·73	·73	·72	·82	1·00	·90	·67	1·33	1·10	1·18
Uric acid. mg. N %	U	—	—	—	·10	·11	·08	·13	·07	·17	·12	·10	·09	·14	·15	·11
Uric acid. mg. UA %	U	—	—	—	·31	·33	·25	·40	·22	·51	·35	·30	·26	·42	·46	·32
Amino acid, mg. N %.	L	5·71	6·36	6·19	6·80	7·00	6·80	7·95	6·33	4·65	4·79	5·49	4·45	8·54	7·69	5·64
	U	4·52	3·50	4·67	5·38	—	4·83	5·83	4·38	2·80	3·98	3·33	4·45	5·42	5·38	5·15
Rest Nitrogen, mg. N %.	L	—	4·49	8·55	6·33	—	9·01	9·50	11·55	12·70	7·84	7·85	4·95	5·54	9·12	9·41
	U	1·02*	·48	6·34	·63	—	2·79	·26	3·95	2·83	3·85	1·26	4·94	− 1·42	3·13	− 0·6

* Includes Uric Acid N.

History: 3. 6.32 — Bluetongue.

Weights: 18.12.31 — 85 lb.
22. 1.32 — 100 lb.
23. 2.32 — 92½ lb.
29. 4.32 — 100 lb.
26. 5.32 — 99 lb.
22. 7.32 — 101 lb.
24. 8.32 — 105 lb.
29.12.32 — 108 lb.

TABLE 66.—Sheep 31905.

Date.		28th Oct., 1931.	30th Oct. 1931.	26th Nov., 1931.	3rd Dec., 1931.	25th Feb., 1932.	2nd March, 1932.	26th March, 1932.	29th April, 1932.	9th May, 1932.
Haemoglobin, gm., per 100 c.c.		10·99	12·94	12·79	11·67	12·13	13·31	13·12	14·28	14·95
Sugar, mg. %	L	52·08	55·55	44·84	51·02	54·64	51·02	47·62	64·52	46·73
(Glucose)	U	46·99	47·62	41·84	47·62	41·66	44·44	37·45	53·48	38·46
Total N., gm. N %		2·590	2·695	2·744	2·744	2·891	2·954	3·080	3·052	3·122
Non-Protein N., mg. %.	L	21·42	14·28	29·26	27·90	33·16	21·43	29·12	24·80	18·52
	U	14·71	—	21·42	23·06	26·08	16·66	20·83	16·66	11·32
Coagulable Nitrogen, gm. N %.	L	2·569	2·681	2·715	2·716	2·858	2·933	2·051	3·027	3·103
	U	2·576	—	2·723	2·721	2·865	2·937	3·059	3·035	3·111
Urea. mg. N %	L	5·67	2·77	10·11	10·17	8·26	8·52	9·20	8·85	5·15
Urea. mg. U %	L	11·80	5·70	21·21	21·30	17·30	17·85	19·32	18·50	10·81
Urea. mg. N %	U	6·82	3·55	10·05	10·24	10·30	9·58	10·63	8·90	4·97
Urea. mg. U %	U	14·30	7·40	21·00	21·50	21·63	20·00	21·70	18·69	10·35
"Total" creatinine. mg. N %	L	2·41	2·32	2·32	2·66	2·14	1·90	2·01	2·04	1·90
"Total" creatinine. mg. TC %	L	6·54	6·26	6·26	7·20	5·76	5·14	5·40	5·50	5·14
"Total" creatinine. mg. N %	U	2·14	1·78	1·82	2·04	1·49	1·49	1·75	1·60	1·44
"Total" creatinine. mg. TC %	U	5·76	4·80	4·90	5·50	4·00	4·00	4·70	4·32	3·86
Uric acid. mg. N %	L	—	·23	·32	·31	·29	·35	·34	·32	·23
Uric acid. mg. UA %	L	—	·70	·97	·94	·86	1·05	1·02	·97	·70
Uric acid. mg. N %	U	—	—	·15	—	·15	·09	·17	·20	·11
Uric acid. mg. UA %	U			·45		·45	·27	·52	·59	·32
Amino acid, mg. N %.	L	6·67	6·36	5·71	6·67	7·37	7·07	7·78	6·03	6·36
	U	5·83	5·22	4·67	5·18	4·52	5·71	4·83	4·38	5·00
Rest Nitrogen, mg. N %.	L	6·67*	2·60	10·80	8·09	5·10	3·59	9·79	7·56	4·88
	U	— ·08*	—	4·88	5·60	—	— ·21	3·45	1·58	— ·20

* Includes uric acid N.

History : 16. 5.31 — Bluetongue.
27. 8.31 — Black quarter.

Weights : 18.12.31 — 100 lb.
22. 1.32 — 121 lb.
23. 2.32 — 118 lb.
29. 4.32 — 131 lb.
29. 4.32 — Discharged.

TABLE 67.—Sheep 32176.

Date.		28th Oct., 1931.	30th Oct., 1931.	26th Nov., 1931.	3rd Dec., 1931.	4th March, 1932.	22nd March, 1932.	31st March, 1932.	29th April, 1932.	9th May, 1932.	1st June, 1932.	23rd June, 1932.	4th July, 1932.	30th Sept., 1932.	22nd Dec., 1932.	25th Jan., 1933.	1st Feb., 1933.
Haemoglobin, gm., per 100 c.c.		10·47	11·67	11·14	12·42	12·94	14·28	13·31	14·08	13·87	12·28	14·95	14·72	11·67	14·72	14·28	13·50
Sugar, mg. %	L	—	58·14	50·00	48·31	52·08	43·48	44·25	56·82	44·84	51·28	48·78	53·19	42·74	43·48	46·08	54·35
(Glucose)	U	—	51·55	38·31	41·66	43·86	36·90	36·97	46·87	38·17	46·51	46·08	44·64	33·67	32·26	36·76	35·97
Total N., gm. N %		2·464	2·506	2·604	2·653	2·772	3·094	2·898	2·954	3·038	2·639	2·996	2·905	2·786	2·856	2·776	2·730
Non-Protein-N., mg. %	L	20·92	—	30·46	28·84	27·26	29·42	26·52	30·46	23·82	21·28	24·80	19·48	17·85	27·90	21·58	24·20
	U	15·39	—	24·00	21·28	16·66	19·11	15·23	22·90	14·63	12·87	13·70	10·91	12·60	21·82	15·00	15·15
Coagulable-N., gm. N %.	L	2·443	—	2·574	2·625	2·745	3·064	2·871	2·924	3·014	2·618	2·971	2·886	2·768	2·828	2·754	2·706
	U	2·449	—	2·580	2·632	2·756	3·074	2·883	2·931	3·023	2·626	2·982	2·894	2·773	2·824	2·761	2·715
Urea. mg. N %	L	5·71	4·95	9·75	10·70	8·75	10·36	8·61	15·53	7·85	4·00	4·50	1·69	4·62	14·65	6·09	7·03
Urea. mg. U %	L	11·97	10·30	20·40	22·47	18·30	21·70	18·06	32·60	16·40	8·40	9·45	3·40	9·66	30·76	12·81	14·70
Urea. mg. N %	U	6·41	5·67	9·75	10·77	8·34	10·77	8·61	16·65	5·77	4·00	3·08	2·22	3·35	14·81	5·99	7·48
Urea. mg. U %	U	13·44	11·80	20·45	22·50	17·50	22·50	18·06	34·90	12·00	8·40	6·31	4·70	6·93	31·08	12·60	15·75
"*Total*" *creatinine.* mg. N %	L	2·48	2·05	2·32	2·66	1·97	2·14	2·23	1·90	1·86	2·01	2·28	2·01	2·01	2·41	2·59	2·36
"*Total*" *creatinine.* mg. TC %	L	6·70	5·54	6·26	7·20	5·32	5·76	6·00	5·14	5·02	5·40	6·16	5·40	5·40	6·54	6·96	6·36
"*Total*" *creatinine.* mg. N %	U	2·23	1·78	1·82	2·01	1·78	1·67	1·97	1·60	1·45	1·75	1·90	1·60	1·75	2·01	1·97	1·86
"*Total*" *creatinine.* mg. TC %	U	6·00	4·80	4·90	5·42	4·80	4·50	5·32	4·32	3·92	4·70	5·14	4·32	4·70	5·40	5·32	5·02
Uric Acid. mg. N %	L	—	·28	·34	·28	·21	·23	·23	·30	·24	·26	·32	·34	·30	·34	·25	·26
Uric Acid. mg. UA %	L	—	·85	1·03	·84	·64	·68	·68	·91	·73	·78	·65	1·03	·91	1·03	·76	·78
Uric Acid. mg. N %	U	—	—	·17	—	·11	·08	·12	·19	·12	·17	·08	·20	·08	·15	·17	·11
Uric Acid. mg. UA %	U	—	—	·50	—	·34	·23	·35	·58	·37	·52	·23	·60	·24	·44	·50	·33
Amino acid, mg. N %.	L	6·67	6·42	7·00	5·96	7·18	7·00	8·14	6·60	6·09	4·19	6·36	5·76	5·83	6·19	5·93	5·46
Amino acid, mg. N %.	U	5·71	4·66	5·38	5·38	5·18	4·12	5·97	4·52	4·12	3·26	4·12	4·81	4·97	5·38	5·26	4·67
Rest Nitrogen, mg. N %.	L	6·06*	—	13·05	11·24	9·15	9·69	7·31	6·13	7·78	1·82	11·34	9·68	5·10	4·31	6·72	9·09
Rest Nitrogen, mg. N %.	U	1·04*	—	6·88	3·12	1·25	2·47	1·45	— ·06	·17	2·69	4·52	2·08	2·45	— 0·53	1·61	1·03

* Includes uric acid N.

History : 26. 5.31 — Bluetongue.

Weights : 18.12.31 — 92½ lb.
22. 1.31 — 112 lb.
23. 2.32 — 104 lb.
29. 4.32 — 115 lb.
26. 5.32 — 117 lb.
22. 7.32 — 120 lb.
24. 8.32 — 123 lb.
29.12.32 — 118 lb.

GROUP E (*six-tooth wethers*).

TABLE 68.—*Haemoglobin gm. per* 100 *c.c.*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	13·0	11·8	—	—	12·6	17·2	14·4	14·3	15·1	—	10·1	—	—	12·3	12·3
31662	12·7	12·3	—	13·3	13·3	15·4	14·7	—	—	—	—	—	—	—	—
31742	14·7	14·3	—	—	14·4	—	14·7	15·2	16·3	—	12·6	—	—	17·5	14·8
31905	12·2	11·7	—	12·1	13·2	14·3	14·9	—	—	—	—	—	—	—	—
32176	11·1	12·4	—	—	13·5	14·1	13·9	13·6	14·7	—	11·7	—	—	14·7	13·9
Av...	12·6	12·6	—	12·9	13·4	15·2	14·6	14·2	15·6	—	11·5	—	—	14·8	13·7

Minimum-maximum variation, 10·1–17·6 gm. per 100 c.c.
Average, 12·18 gm. per 100 c.c.

The following table indicates the distribution:—

gm. per 100 *c.c.*	*Occurrence.*
10–11	3
11–12	8
12–13	13
13–14	12
14–15	16
15–16	6
16–17	1
17–18	5

25 % of the determinations lie between 14 and 15 gm. per 100 c.c. and 63 % between 12 and 15 gm. per 100 c.c.

TABLE 69.—*Sugar mg.* % (" *Laked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	37·7	52·4	—	—	42·0	84·0	52·1	52·6	46·3	—	44·3	—	—	43·1	43·7
31662	46·7	45·9	—	51·6	46·1	53·2	49·6	—	—	—	—	—	—	—	—
31742	39·4	40·3	—	—	44·3	—	41·7	41·8	45·8	—	51·3	—	—	50·0	52·7
31905	50·2	51·0	—	54·6	49·3	64·5	46·7	—	—	—	—	—	—	—	—
32176	54·1	48·3	—	—	46·6	56·8	44·8	50·0	53·2	—	42·7	—	—	43·5	50·2
Av...	45·4	47·3	—	52·9	46·1	64·5	48·0	48·6	47·5	—	46·1	—	—	45·5	48·9

TABLE 70.—*Sugar mg.* % (" *Unlaked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	32·4	42·4	—	—	37·9	76·3	45·1	45·1	37·7	—	37·2	—	—	42·0	34·4
31663	40·7	36·0	—	35·4	40·0	41·8	38·6	—	—	—	—	—	—	—	—
31742	35·2	31·4	—	—	33·8	—	29·3	33·0	33·7	—	39·2	—	—	32·3	36·4
31905	45·5	47·6	—	41·7	40·9	53·5	38·5	—	—	—	—	—	—	—	—
32176	47·8	41·7	—	—	38·9	46·9	38·2	46·3	44·6	—	33·7	—	—	32·3	36·4
Av...	40·9	39·0	—	37·5	37·8	54·6	39·3	42·7	37·5	—	36·7	—	—	35·5	35·7

" Laked " Filtrates.

Minimum-maximum variation, 36–84 mgm. %.
Average, 48·4 mg. %.

" Unlaked " Filtrates.

Minimum-maximum variation, 27–76 mg. %.
Average, 39·6 mg. %.
Average difference, 8·8 mg. %.

The following table indicates the distribution:—

mg. %.	*Occurrence.*	*mg. %.*	*Occurrence.*
30–35	1	25–30	6
35–40	9	30–35	10
40–45	14	35–40	21
45–50	14	40–45	17
50–55	22	45–50	10
55–60	3	50–55	2
60–65	1	more than 65	1
more than 65	1		

" Laked " Filtrates.

33 % of the determinations lie between 50 and 55 mg. %.
77 % of the determinations lie between 40 and 55 mg. %.

" Unlaked " Filtrates.

32 % of the determinations lie between 35 and 40 mg. %.
80 % of the determinations lie between 30 and 45 mg. %.

The differences between " laked " and " unlaked " vary between 3 % and 34 %, with an average of 18 %.

TOTAL NITROGEN.

Minimum-maximum variation, 2·4–3·2 gm. N %.
Average, 2·8 gm. N %.

TABLE 71.—*Non-Protein Nitrogen mg. % (N.P.N.) (" Laked ").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	15·9	26·6	—	—	24·9	17·9	23·7	22·7	19·6	—	17·7	—	—	27·7	21·1
31662	34·5	26·3	—	32·0	34·7	25·1	25·9	—	—	—	—	—	—	—	—
31742	20·5	29·2	—	—	24·9	—	25·6	26·8	18·3	—	20·7	—	—	37·5	23·9
31905	29·6	27·9	—	33·2	25·3	24·8	18·5	—	—	—	—	—	—	—	—
32176	30·5	28·8	—	—	27·7	30·5	23·8	23·0	19·5	—	17·9	—	—	27·9	22·9
Av...	26·1	27·8	—	32·4	26·6	24·6	23·9	23·9	19·0	—	18·7	—	—	31·0	22·7

TABLE 72.—*Non-Protein Nitrogen N.P.N. mg. % (" Unlaked ").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	11·5	20·3	—	—	15·7	11·8	16·7	13·4	12·5	—	11·5	—	—	21·6	13·7
31662	23·3	20·6	—	22·6	26·2	16·1	18·1	—	—	—	—	—	—	—	—
31742	12·5	22·7	—	—	14·1	—	14·7	15·4	9·8	—	16·7	—	—	27·0	15·4
31905	18·1	23·1	—	26·1	18·7	16·7	11·3	—	—	—	—	—	—	—	—
32176	18·7	21·3	—	—	17·0	22·9	14·6	13·3	10·9	—	12·6	—	—	21·8	15·1
Av...	17·6	21·6	—	23·8	17·4	16·9	13·8	13·9	11·1	—	13·5	—	—	23·5	14·6

" Laked " Filtrates.

Minimum-maximum variation, 14·28–37·5 mg. N %.
Average, 25 mg. N %.

" Unlaked " Filtrates.

Minimum-maximum variation, 9·43–27·0 mg. N %.
Average, 16 mg. N %.
Average difference, 9 mg. N %.

The following table indicates the distribution:—

" Laked " Filtrates.		*" Unlaked " Filtrates.*	
mg. %.	*Occurrence.*	*mg. %.*	*Occurrence.*
Below 20	11	Below 10	1
20–25	21	10–15	22
25–30	25	15–20	20
30–35	7	20–25	15
above 35	1	25–30	4

" Laked " Filtrates.

38 % of the determinations lie between 25 and 30 mg. N %.
70 % of the determinations lie between 20 and 30 mg. N %.

" Unlaked " Filtrates.

35 % of the determinations lie between 10 and 15 mg. N %.
68 % of the determinations lie between 10 and 20 mg. N %.

The differences between the " laked " and " unlaked " filtrates vary from 19 % to 47 %, with an average of 36 %.

TABLE 73.—*Urea Nitrogen mg. %* (*" Laked "*).

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	4·4	12·7	—	—	8·6	5·2	7·6	6·3	2·9	—	4·9	—	—	13·8	5·6
31662	10·3	11·3	—	10·8	10·9	10·8	6·5	—	—	—	—	—	—	—	—
31742	6·3	12·3	—	—	6·2	—	5·6	6·8	2·9	—	6·1	—	—	19·6	5·3
31905	6·4	10·2	—	8·3	8·9	8·9	5·2	—	—	—	—	—	—	—	—
32176	7·4	10·7	—	—	9·2	15·5	7·9	4·3	1·7	—	4·6	—	—	13·7	6·5
Av...	6·9	10·5	—	10·0	8·4	10·1	6·5	5·4	2·7	—	5·2	—	—	15•7	5·8

" Laked " Filtrates.

Minimum-maximum variation, below 1·80–19·62 mg. N %.
Average, 9·6 mg. N %.

The following table indicates the distribution of the " laked " figures:—

	Occurrence.
Below 4	7
4– 5	7
5– 6	6
6– 7	8
7– 8	5
8– 9	8
9–10	4
10–11	5
above 11	9

36 % of the determinations lie between 4 and 7 mg. N %.

TABLE 74.—*"Total" Creatinine Nitrogen mg. % ("Laked").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	2·0	2·4	—	—	2·1	2·0	1·8	2·4	2·2	—	2·1	—	—	1·8	2·0
31662	2·4	2·8	—	2·2	2·1	2·2	2·2	—	—	—	—	—	—	—	—
31742	2·1	2·6	—	—	2·0	—	2·0	2·4	2·1	—	2·0	—	—	2·4	2·3
31905	2·3	2·7	—	2·1	2·0	2·0	1·9	—	—	—	—	—	—	—	—
32176	2·2	2·7	—	—	2·1	1·9	1·9	2·1	2·0	—	2·0	—	—	2·4	2·5
Av...	2·2	2·6	—	2·2	2·1	2·0	2·0	2·3	2·1	—	2·0	—	—	2·2	2·3

TABLE 75.—*"Total" Creatinine Nitrogen mg. % ("Unlaked").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	1·8	1·8	—	—	1·5	1·4	1·4	1·8	1·7	—	1·7	—	—	1·5	1·8
31662	1·9	2·1	—	1·8	1·6	1·4	1·1	—	—	—	—	—	—	—	—
31742	1·9	2·2	—	—	1·6	—	1·6	1·8	1·6	—	1·6	—	—	2·0	1·6
31905	1·9	2·0	—	1·5	1·6	1·6	1·4	—	—	—	—	—	—	—	—
32176	1·9	2·0	—	—	1·8	1·6	1·5	1·8	1·6	—	1·8	—	—	2·0	1·9
Av...	1·9	2·0	—	1·7	1·6	1·5	1·4	1·8	1·6	—	1·7	—	—	1·9	1·8

"Laked" Filtrates.

Minimum-maximum variation, 1·67–2·81 mg. N %.
Average, 2·18 mg. N %.

"Unlaked" Filtrates.

Minimum-maximum variation, 0·93–2·32 mg. N %.
Average, 1·73 mg. N %.
Average difference, 0·45 mg. N %.

The differences of the "laked" and "unlaked" "T".C.N. figures vary between 4 % and 44 %, with an average of 21 %.

TABLE 76.—*Uric Acid Nitrogen mg. % ("Laked").*

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	·26	·29	—	—	·22	·28	·24	—	·26	—	·19	—	—	·39	·30
31662	·39	·38	—	·31	·23	·32	·30	—	—	—	—	—	—	—	—
31742	·30	·36	—	—	·24	—	·24	·27	·31	—	·22	—	—	·44	·37
31905	·27	·31	—	·29	·35	·32	·23	—	—	—	—	—	—	—	—
32176	·31	·28	—	—	·23	·30	·24	·29	·34	—	·30	—	—	·34	·25
Av...	·30	·33	—	·33	·25	·31	·26	·28	·30	—	·24	—	—	·39	·31

"Laked" Filtrates.

Minimum-maximum variation, Less than ·10–·44 mg. N %.
Average, ·29 mg. N %.

"Unlaked" Filtrates.

Minimum-maximum variation, Less than ·10–·20 mg. N %.

TABLE 77.—*Amino-Acid Nitrogen mg. %* (" *Laked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	Juue.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	7·2	6·0	—	—	6·2	7·1	6·7	5·4	5·6	—	6·5	—	—	6·8	5·4
31662	6·5	6·7	—	8·4	8·2	6·0	8·2	—	—	—	—	—	—	—	—
31742	6·0	6·5	—	—	7·3	—	6·3	4·7	5·1	—	7·5	—	—	8·5	6·8
31905	6·0	6·7	—	7·4	7·4	6·0	6·4	—	—	—	—	—	—	—	—
32176	6·7	6·0	—	—	7·4	6·6	6·1	5·3	5·8	—	5·8	—	—	6·2	5·7
Av...	6·5	6·3	—	8·0	7·2	6·4	6·9	5·1	5·5	—	6·6	—	—	7·2	5·9

TABLE 78.—*Amino-Acid Nitrogen mg. %* (" *Unlaked* ").

Sheep No.	Nov.	Dec.	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
28437	5·4	5·2	—	—	4·9	4·9	4·9	3·9	3·9	—	4·4	—	—	5·8	4·8
31662	5·3	5·0	—	5·4	5·6	4·0	5·1	—	—	—	—	—	—	—	—
31742	4·0	5·0	—	—	5·3	—	4·4	2·8	3·6	—	4·5	—	—	5·4	5·3
31905	5·2	5·2	—	4·5	5·3	4·4	5·0	—	—	—	—	—	—	—	—
32176	5·3	5·4	—	—	5·1	4·5	4·1	3·7	4·8	—	5·0	—	—	5·4	4·9
Av...	5·1	5·1	—	5·2	5·2	4·4	4·8	3·5	4·0	—	4·6	—	—	5·5	5·0

" *Laked* " *Filtrates.*

Minimum-maximum variation, 4·19–7·14 mg. N %.
Average, 6·39 mg. N %.

" *Unlaked* " *Filtrates.*

Minimum-maximum variation, 2·80–5·79 mg. N %.
Average, 4·85 mg. N %.
Average difference, 1·54 mg. N %.

The difference of the " laked " and " unlaked " figures vary from 14 % to 47 % with an average of 30 %.

(D) GENERAL COMPARISON OF GROUPS A, B, C, D AND E.

Hæmoglobin (*Hb.*).—It seems that no seasonal variations take place.

The Hb. content of the young lambs (B) and young ewes (D) are the lowest, while that of the 6-tooth sheep are the highest (C and E) (A. 14·7, B. 13·7, C. 16·7, D. 13·2, E. 17·6 gm. per 100 c.c.).

Sugar.—Green fodder was excluded from the ration in winter, being not available, and the blood sugar level of the sheep increased in the case of the sheep of the four older groups (A, C, D, E). That the sugar content was affected by the addition of green fodder towards December (1932), and the withdrawal again after the analyses were done, is evident from Graph III, but a definite conclusion cannot be drawn, since in Group A the sugar decreased in the " laked " filtrate from September to December (1932) and increased in the " unlaked " filtrate. From December (1932) the sugar decreased in both filtrates. On the contrary in Groups D and E it decreased in both filtrates from September to December and increased towards January (1933). In Group C the " laked " level increased from September to December (1932) and decreased to January (1933), while the sugar in the " unlaked " filtrate decreased over the whole period. (For A and B see Graph III, for C, D and E Tables 36, 37, 53, 54, 69 and 70.)

The blood sugar level of the young lambs (B) is high but decreased during the first 6-7 months. The sugar content fell gradually showing occasional rises during the period of transition from a higher to a lower level.

The following figures are given for comparative purposes:—

	mg. %		*mg.* %
A av. L	43·3	U	35·2
B av. L	57·6	U	50·9
C av. L	46·2	U	36·8
D av. L	48·4	U	38·0
E av. L	48·4	U	39·6

The sugar levels of Groups A, C, D and E are fairly close to each other, A being the lowest by a few mg. %. The young lambs (B) however, have a relatively much higher blood sugar level.

The "laked" and "unlaked" curves both show the same general tendencies (Graph III.)

The average percentage difference of the "laked and "unlaked" figures differ little in the different groups except in Group B which is the lowest.

(A, 19 %; B, 12 %; C, 20 %; D, 20 %; E 18 %.)

Individual differences amongst sheep of the same sex and age have been noted in all the various groups (c.f. Tables 8, 9, 22, 23, 36, 37, 53, 54, 69 and 70.)

Total Nitrogen.—No seasonal variations occur with this constituent.

The figures for younger sheep are lower than those of the old ewes. (A, 3·0; B, 2·8; C, 2·9; D, 2·75; E, 2·8 gm. per 100 c.c.). Here also individual differences amongst sheep of the same sex and age have been noted in all the various groups.

Non-Protein Nitrogen (*N.P.N.*).—The N.P.N. content of blood is very much affected by the nature of the diet particularly when green fodder is supplied or not (vide Tables 10, 11, 24, 25, 38, 39, 55, 56, 71, 72, and Graph IV).

From September to December when green forage was supplied it rose in all the groups but decreased again during January after such forage had been withdrawn for about a month. The N.P.N. decreased during the winter months (March to July, see Graph IV).

The N.P.N. do not differ to a notable extent in the five groups:

	mg. N %		*mg. N* %
A av. L	24	U	16
B av. L	23	U	15
C av. L	26	U	19
D av. L	26	U	18
E av. L	25	U	16

The "laked" and "unlaked" N.P.N. curves have usually the same tendencies and run generally parallel to each other (Graph IV).

For comparative purposes the following average percentage differences of the average " laked " and " unlaked " figures for the five groups are stated :—

A ... ... 34 %
B ... ... 35 %
C ... ... 27 %
D ... ... 31 %
E ... ... 36 %

Individual differences are also recorded in all the groups.

Urea Nitrogen.—The urea nitrogen curves generally run parallel with the N.P.N. curves (see e.g. Graph IV).

As the N.P.N. increases the urea nitrogen percentage of the N.P.N. increases and vice versa. This is just the opposite to what happens in the case of the amino-acids (see Graphs I and II).

The following averages afford a ready comparison between the various groups.

A av. L 7·6 mg. N %
B av. L 6·6 mg. N %
C av. L 9·8 mg. N %
D av. L 9·3 mg. N %
E av. L 9·6 mg. N %

The average of Group B is the lowest, but it must be noted that the lambs were not included from the beginning of the experiment.

The content of urea nitrogen in the " laked " filtrate exceeds usually that in the " unlaked " filtrate, by a very small margin, mostly less than 1 mg. N %.

Individual differences have also been recorded for all the groups (see Tables 12, 26, 40, 57 and 73).

" Total " Creatinine Nitrogen.—As in the case of the other constituents no definite seasonal variation can be noted (see Graphs I, II and IV, and Tables 13, 14, 27, 28, 41, 42, 58, 59, 74 and 75.)

Again the variations, in the latter part of the experiment where the green fodder was added and later withdrawn from the ration, should be noted to emphasize the influence of diet on composition.

The percentage nitrogen of the N.P.N. tends to change reciprocally as the N.P.N. (in mg. %) varies.

The following averages are given for comparison :—

	mg. N %.		*mg. N %.*
A L	2·14	U	1·63
B L	2·04	U	1·59
C L	2·17	U	1·79
D L	2·22	U	1·75
E L	2·18	U	1·73

The following are the percentage differences between the averages of the " laked " and " unlaked " figures: A, 24·5 %; B, 23·0 %; C, 18·0 %; D, 21 %; E, 21 %.

Uric Acid Nitrogen.—No definite seasonal variations can be noticed (Graph IV and Tables 15, 29, 43, 60 and 76).

The percentage nitrogen of the N.P.N. is fairly constant:—

(A 1·3, 1·3, 1·1, 1·0, 1·3, 1·1, 1·3, 1·3, ·57, 1·3.)
(B ·8, ·9, 1·2, 1·0, 1·2, 1·3, 1·0, 1·0.)
(C 1·3, ·9, 1·0, 1·2, 1·0, 1·4, ·51, 1·6.)
(D ·8, ·9, 1·2, 1·2, ·7, 1·6, 1·2, ·9, 1·1.)
(E 1·1, 1·2, ·9, 1·3, 1·1, 1·2, 1·6, 1·3, 1·3, 1·4.)

The following are the " laked " averages: A ·28, B ·20, C ·29, D ·36, E ·29. The average of Group B is definitely below that of the other groups.

Amino-Acid Nitrogen.—The blood amino acid levels do not change much towards winter, the levels in all groups however increasing towards December (1932) and with the exception of C decreased towards January (1933) (see Graph IV).

The percentage amino-acid nitrogen of the N.P.N. increases that of the urea nitrogen decreases, and the plotted curves consequently cross each other for a period during the winter months, most likely associated with the change in the ration. Thus the percentage amino-acid increases as the N.P.N. content of the blood decreases.

The following averages are given for comparison:—

	mg. N %.		*mg. N %.*
A L	6·15	U	4·43
B L	6·67	U	4·60
C L	6·37	U	4·57
D L	6·39	U	4·80
E L	6·55	U	4·85

In the case of " laked " filtrate of lambs the animo-acid content of blood is the highest, whereas for " unlaked " filtrate the highest average is that of Group E (wethers).

The following figures represent the percentage differences of the averages for the " laked " and " unlaked " filtrates: A 31, B 30·5, C 28·0, D 28·5, E 30·0.

Discussion.

Sugar.—A possible explanation for the rise of sugar in blood during the winter may be that the animals at that time require more carbohydrate to cater for the necessary energy requirement and thus have a higher sugar content in the blood. This change may also be partly or wholely ascribed to the ration factor. Attention has been previously drawn to this aspect.

Folin (1930) states that his " unlaked " blood filtrates are free from non-sugar reducing substances. If this is the case the higher figures of the " laked " blood filtrates may be ascribed to one or more of the following three factors (Benedict, 1928):—

(1) The presence of non-carbohydrates reducing substances which may affect the oxidation agent.

(2) The presence of non-glucose carbohydrate reducing substance (Hawk, 1931, p. 154).

(3) The presence of one or more substances in the blood filtrate which may cause a change in the copper complex so that the copper will be more easily reduced by the glucose or other reducing substances present (Hawk, 1931, p. 413; Benedict, 1929; Somogyi, 1927; 1930, 1931, etc.).

The first factor is usually regarded as the most essential, although Folin and Svedberg and Sjollema state that blood contains large quantities of non-glucose reducing carbohydrates. Thus it seems that special advantages are attached to the figures of the " unlaked " blood and that the figures are of more value than the " laked " blood sugar figures.

Only one explanation on the higher sugar content of lamb blood can at present be given, viz. the active metabolism going on in the young rapid-growing animals. Further research work on lamb blood is necessary to elucidate this problem.

Non-protein Nitrogen.—The non-protein nitrogen in the " laked " blood filtrate is always much higher than in the " unlaked " filtrate. The rest nitrogen in case of " unlaked " blood filtrate is always much less than in the " laked " filtrate, i.e. the sum of the urea nitrogen, " total " creatinine nitrogen, uric acid nitrogen and amino acid nitrogen is approximately the same as the non-protein nitrogen. Thus the undetermined nitrogen is small.

Lower amounts of non-sugar reducing substances go parallel with the lower nitrogen content in the various kinds of blood filtrates (Somogyi, 1930).

The amount of non-protein nitrogen varies according to the substances of which it is constituted, alterations in the urea level owing to the relatively large amount in the blood, particularly affecting the N.P.N. (Hawk, 1931, p. 415).

Urea Nitrogen.—The urea nitrogen is approximately the same in the two kinds of filtrates. As a rule when the urea nitrogen varies the non-protein nitrogen is correspondingly influenced.

An important phenomenon which has been noticed is that the urea nitrogen percentage of the N.P.N. falls, while the amino-acid percentage rises. While the essential catabolic end product of the proteins in the body is urea, one would not expect such a fall in urea nitrogen, particularly since the amino acid (in mg. N %) fraction is so remarkably constant.

The percentage curves of the other nitrogen-containing constituents are also inclined to change in the opposite direction to the urea nitrogen percentage curves, but the percentage nitrogen lost in the urea decrease is not made good through the other nitrogen-containing substances increasing, e.g. a larger percentage of the N.P.N. can be accounted for in November and December (1931) than in June, 1932 (Group A, Graph I). The percentage rest nitrogen calculated on the N.P.N. thus rises towards winter, although the rest nitrogen in mg. N % does not rise, but remains relatively constant. More accurate control and simultaneous analyses of blood, food and faeces would give one a better opportunity to be more definite about the deviations, but such research was not included in the original object of this work, viz. to furnish " normal " figures.

" Total " Creatinine Nitrogen.—The " total " creatinine nitrogen remains fairly constant over the whole period. The " unlaked " blood figures are relatively lower than the " laked " blood figures. Very little creatinine was found in sheep blood and it was found impossible to determine this constituent accurately.

Uric Acid Nitrogen.—The uric acid in the " unlaked " blood filtrate was usually above 50 % less than in the " laked " blood filtrate. Often the " unlaked " was undeterminably small. The uric acid nitrogen in " unlaked " blood filtrate is also extremely low.

Amino-Acid Nitrogen.—The amino-acid nitrogen remains fairly constant in both filtrates, but the figures in the " unlaked " blood filtrate are considerably lower than in the " laked " blood filtrate.

Finally, it must be noted that Group A includes three pregnant ewes, but since their figures do not show any definite difference as compared with the other three, it is not discussed here.

(E) COMPARISON WITH RESULTS OF OTHER WORKERS.

In spite of an extensive search in the available literature no data on the comparative values of " laked " and " unlaked " blood filtrates of sheep could be found. Even the normal data by any method are relatively scarce and fragmentary referring in many cases to analyses performed on one single sample of blood of a few animals and rarely more analyses on one and the same animal. No data extending over any time period of over 14 days or concerning age and sex was available. Furthermore, no nitrogen partition comprising *all* the constituents detailed in this paper has been found, the amino-acid nitrogen fraction particularly being generally omitted. If the history of the development of biochemical methods and the rapid strides made during the last decade in the evolution of a more accurate technique are considered, these deficiencies, or rather lack of more accurate and complete range of figures for the various constituents can be readily understood.

Below some figures gleaned from the available literature have been tabulated, together with my own data for comparison. In many cases these results were obtained by using different methods, with the result that an accurate comparison can hardly be made (Hawk, 1931; Host and Hatlehol, 1920, etc.). To give on example, the normal blood sugar figures for the human being obtained by using the following methods differ as follows:—

Folin-Wu method	90–120	mg. %
Folin-Malmros and Hagedorn-Jensen methods	75–105	,,
Folin's modification of Folin-Wu method ...	75–105	,,
Benedict Copper Reduction method	70–100	,,
Somogyi's method	70–100	,,

Sugar.

Year.	Author.	Method.	No. of Analyses.	Mg. %.	Remarks.
1911	Lyttkens and Sandgren (1911)	Bang.....	1	64	Plasma.
1923	Scheunert Pelchrzim (1923)	Folin & Wu.....	2 sheep	50·9–71·4 Av. 59·8	Blood "laked" filtrate
1927	Kleineberger Abderhalden. Bodansky (1927)	—	—	54–61 70 70	
1929	Volker (1929).....	Folin–Wu, Hagedorn–Jensen	4	44–61 Av. 51·8	Blood.
1929	Norris & Chamberlin ('29)	Maclean.....	Slaughter house blood 64	42–118 Av. 61	64 sheep bled once. Wethers, ewes, lambs.
1933	Graf (1933).....	Folin & Svedberg	20 anal.	37–55·5 Av. 47·4	"Laked" blood.
1933	Graf.....	„	20 anal.	31·3–50·5 Av. 39.	"Unlaked" blood.
1933	Hamersma.....	„	46 anal.	42·7–79·4 Av. 57·6	3 lambs, "laked" blood.
1933	„	„	46 anal.	35·8–70·9 Av. 50·8	"Unlaked" blood.
1933	„	„	6 sheep 80 anal.	27·0–59·5 Av. 43·3	Ewes "laked" blood.
1933	„	„	6 sheep 83 anal.	19·6–51·3 Av. 35·1	Ewes "unlaked" blood.
1933	„	„	3 sheep 33 anal.	34–74 Av. 46·2	"Laked" blood, 6 tooth ewes.
1933	„	„	3 sheep 33 anal.	23–61 Av. 36·8	6 tooth ewes "unlaked" blood.
1933	„	„	6 lambs 84 anal.	34–81 Av. 48·4	Ewe lambs "laked" blood.
1933	„	„	6 lambs 84 anal.	29–63 Av. 38·05	Ewe lambs "unlaked" blood.
1933	„	„	5 sheep 65 anal.	36–84 Av. 48·4	6 tooth wethers "laked" blood.
1933	„	„	5 sheep 66 anal.	27–53 Av. 39·6	6 tooth wethers "unlaked" blood.

As will be noticed from the above table the blood sugar content of sheep under South African conditions is lower than that found else where. Unfortunately diet and ages have not been specified in most cases and therefore a detailed comparison is not possible. But it will be noted that Scheunert and Pelchrzim's hay-fed sheep approximate our blood sugar figures. Other figures given by them (not incorporated here) indicate clearly the influence of diet on the blood sugar content, e.g. sheep receiving a diet of hay, yeast, mealies and cocoanut cake (amounts not stated) shows figures up to 89·9 mg. %. It is probable, therefore, that the generally higher level found elsewhere is associated with the better quality of food fed; furthermore, the methods, as already stated, may also play a rôle.

Non-Protein Nitrogen.

Year.	Author.	Method.	Number of Analyses.	Mg. N Percentage.	Remarks.
1913	Folin & Denis....	Folin & Denis..	Sheep	28	
1923	Scheunert & Pelchrzim	Folin & Wu....	2 sheep 7 anal.	24–42·9 Av. 31·2	Fed with hay.
1929	Norris & Chamberlin	Folin.....	25 sheep bled once	19·25–40·7 Av. 28·2	Ewes and wethers..
1929	„	„	26 lambs bled once	14·48–38·2 Av. 28·8	Lambs.
1933	Graf.....	Folin–Wu.....	9 sheep 20 anal.	13·6–20·0 Av. 16·5	Adult Sheep. L Jul. and Aug.
1933	„	„	9 sheep 20 anal.	9·4–15·3 Av. 12·5	U Jul. and Aug.
1933	Hamersma.....	„	6 sheep 86 anal.	13·39–48·4 Av. 24·0	Adult Sheep L.
	„	„	6 sheep 83 anal.	8·72–39·4 Av. 16·2	Adult ewes U.
	„	„	3 lambs 46 anal.	14·85–32·4 Av. 23	L. blood.
	„	„	3 lambs 46 anal.	9·31–25·8 Av. 14·5	U. blood.
	„	„	3 sheep 28 anal.	20·98–39·0 Av. 26	6 tooth ewe "laked" blood.
	„	„	3 sheep 29 anal.	10·7–27·4 Av. 19	6 tooth ewe "unlaked" blood.
	„	„	6 lambs 81 anal.	14·6–43·2 Av. 26	6 ewe lambs "laked" blood.
	„	„	6 lambs 80 anal.	8·5–35·3 Av. 18	Ewe lambs "unlaked" blood.
	„	„	5 sheep 65 anal.	14·28–37·5 Av. 25	6 tooth wethers "laked" blood.
	„	„	5 sheep 62 anal.	9·4–27·0 Av. 16	6 tooth wethers "unlaked" blood.

The striking fact here is that under South African conditions the non-protein nitrogen is on the whole so exceptionally low. This is again probably associated with the ration and climatic environment (drought). The figures obtained by Norris and Chamberlin were gathered under what must be considered unfavourable conditions, the blood being collected at a slaughter-house and, therefore, representing "mixed" blood, i.e. both venous and arterial. Furthermore, the time interval before analyses (3 hours) was too long to obtain accurate results. This can be clearly seen when adding the nitrogen containing constituents which, in some cases, then approximate the non-protein nitrogen figures although "total" creatinine and amino-acid nitrogen are not even included, i.e. the N.P.N. in these cases must be too low or one or other constituent, probably urea, must be too high, or both alternatives may also be possible.

Urea Nitrogen.

Year.	Author.	Method.	Number of Analyses.	Mg. N Percentage.	Remarks.
1913	Folin & Denis....	Folin & Denis..	Sheep	13·0	
1923	Scheunert & Pelchrzim	Folin–Wu.....	2 sheep 7 anal.	7·5–23·1 Av. 12·0	
1929	Norris & Chamberlin	Maclean.....	55 Sheep once each	6·26–21·8 Av. 12·8	Wethers, ewes and lambs.
1933	Graf.....	Folin & Svedberg	9 sheep 20 anal.	3·1–7·3 Av. 4·9	"Laked" blood. Jul. and Aug.
1933	„	„	9 sheep 20 anal.	3·0–7·3 Av. 4·7	"Unlaked" blood. Jul. and Aug.
1933	Hamersma.....	„	6 sheep 80 anal.	1·85–31·5 Av. 7·56	"Laked" blood. Adult ewes.
	„	„	6 sheep 80 anal.	Less than 1·5–31·5	"Unlaked" blood. Adult ewes.
	„	„	3 lambs 45 anal.	Less than 1·5–17·69 Av. 6·6	"Laked" blood.
	„	„	3 lambs 45 anal.	Less than 1·5–18·05	"Unlaked" blood.
	„	„	3 sheep 28 anal.	1·5–20·78 Av. 9·83	6 tooth ewe. "Laked" blood.
	„	„	3 sheep 28 anal.	1·5–17·24	"Unlaked" blood. 6 tooth ewes.
	„	„	6 lambs 84 anal.	1·5–21·48 Av. 9·28	Ewe lambs. "Laked" blood.
			6 sheep 84 anal.	1·5–21·87	Ewe lambs. "Unlaked" blood.
	„	„	5 sheep 59 anal.	1·5–19·62 Av. 9·6	"Laked" blood. 6 tooth wethers.
	„	„	5 sheep 59 anal.	1·5–19·84	6 tooth wethers. "Unlaked" blood.

As the South African N.P.N. figures are relatively low, the logic conclusion is that the urea nitrogen must also be low, since this N fraction is normally responsible for from 13 % to over 50 % of the N.P.N. nitrogen.

Uric Acid Nitrogen.

Year.	Author.	Method.	Number Analyses.	Mg. N Percentage.	Remarks.
1913	Folin & Denis (1)..	Folin & Denis..	Sheep	·05	
1914	Steinitz.....	—	Sheep	1·0–1·5	
1929	Norris & Chamberlin	Benedict.....	34 sheep each once	·71–1·72	Wethers.
1929	„	„	28 lambs each once	·90–1·56	
1933	Graf.....	Folin.....	9 sheep 20 anal.	·15–·26 Av. ·22	"Laked" blood.
1933	„	„	9 sheep 20 anal.	·10–·22 Av. ·13	"Unlaked" blood.
1933	Hamersma.....	„	6 sheep 68 anal.	Less than ·10–·48 Av. ·28	"Laked" blood. Adult ewes.
1933	„	„	6 sheep 68 anal.	Less than ·10–·30	"Unlaked" blood. Adult ewes.
1933	„	„	3 lambs 45 anal.	Less than ·10–·43 Av. ·20	"Laked" blood.
1933	„	„	3 lambs 45 anal.	Less than ·10–·24	"Unlaked" blood.
1933	„	„	3 sheep 28 anal. 45 anal.	Less than ·08–·52 Av. ·29	6 tooth ewes. "Laked" blood.
1933	„	„	3 sheep 28 anal.	Max. ·19	6 tooth ewes. "Unlaked" blood.
1933	„	„	6 lambs 84 anal.	Less than ·08–·52 Av. ·36	Ewe lambs. "Laked" blood.
1933	„	„	6 lambs 84 anal.	Max. ·24	Ewe lambs. "Unlaked" blood.
1933	„	„	5 sheep 59 anal.	Less than ·08–·44 Av. ·29	6 tooth wethers. "Laked" blood.
1933	„	„	5 sheep 59 anal.	Max. ·20	6 tooth wethers. "Unlaked" blood.

With the exception of (1) less uric acid has been found under South African conditions than has been found by other workers. During the analyses it was found that partly coagulated blood was higher in uric acid nitrogen (e.g. 1·3 mg. N %), but such blood was always discarded.

(F) GENERAL SUMMARY.

1. "Laked" and "unlaked" blood filtrates of 23 sheep of various ages were analysed.

2. The blood analyses were done over a period of 15 months in the case of 20 sheep, and 11 months in the case of 3 lambs. The same animals have always been used during the stated period.

3. Determinations of all the groups have been made for haemoglobin, total nitrogen, urea nitrogen, "total" creatinine nitrogen, uric acid nitrogen and amino-acid nitrogen in the two blood filtrates respectively.

4. The normal range and the average of each constituent, together with the average difference %, etc., of all the groups are given.

5. Graphs of two groups (A and B) of the 5 groups illustrate the averages of all the constituents (except Hb, and T.N.) of the blood over the stated periods; and other graphs the nitrogen containing substances (except T.N.) expressed as per cent. of the N.P.N.

6. Comparisons of the results with those of other workers are included.

(G) ACKNOWLEDGMENTS.

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