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SECTION IV.

Diabetogenic and Pancreotropic Actions of Ox Anterior Pituitary Extract in Rabbits.

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Following the production of temporary diabetes by Evans, Meyer, Simpson and Reichert (1932), Baumann and Marine (1932) and Houssay, Biasotti and Rietti (1932), Young (1937) induced permanent diabetes in adult dogs by an intensive course of crude anterior pituitary extract. This discovery was confirmed by Campbell and Best (1938) and Dohan and Lukens (1939). Richardson and Young (1938) and Richardson (1940) examined the pancreases of dogs so rendered temporarily or permanently diabetic and found that the beta cells of the islets of Langerhans showed variable degrees of degranulation, hydrops or hyalinisation. Lukens and Dohan (1942) observed similar changes in the islet tissue of cats made diabetic by partial pancreatectomy and subsequent treatment with pituitary extract. The production of such lesions experimentally is important inasmuch as corresponding phenomena have been described in human diabetic cases by Opie (1901), Cecil (1908), Weichselbaum (1911) and Warren (1938). The present investigation accordingly aimed at reproducing and evaluating the above mentioned changes, but in these objectives was frustrated by the choice of the rabbit as the experimental animal. The research, nevertheless/

nevertheless, realised certain positive and interesting conclusions.

METHODS.

Extract. This material was a crude saline product of ox anterior pituitary glands prepared after the method of Young (1938 A). The fresh whole glands were brought on ice to the laboratory and the anterior lobes were separated by careful dissection. The extract was made up so that 2 c.c. were equivalent to 1 g. gland. It was stored at a low temperature without freezing and used within five or at most six days of preparation. The method of administration was by injection intraperitoneally in three animals and subcutaneously in twenty five animals. The injections were given daily and consisted either in a constant amount of 1.5 g. gland per kg. body weight or in a quantity which was increased by 0.5 g. gland per kg. at intervals of five or six days from an initial 1 g. gland per kg. to a final 2.5 g. gland per kg. body weight. Aseptic precautions were observed during both preparation and administration of the extract.

Animals. The 28 rabbits used in this investigation comprised 27 English (Nos. 2 - 32 in Table 1) and 1 Dutch (No. 1 in Table 1) and included 13 males and 15 females. Their weight varied between 1502 g. and 2352 g., the average being 1899 g. They were kept in metabolism cages and given a daily allowance/

allowance of 100 g. of mixed bran, corn and maize, 300 g. of cabbage and water ad lib. Daily measurements included food consumption, body weight, urine volume and, when present, urine sugar and urine ketones. The 10 control rabbits used to estimate the pancreatic islet tissue were also English and consisted of 7 males and 3 females. They weighed between 1530 g. and 2380 g. and averaged 1947 g. so that they proportionately covered the range of weights of the 28 injected animals.

Estimations. Urine sugar was estimated by Cole's method, urine ketones by the Van Slyke-Denigès method and blood sugar by the Hagedorn-Jensen method. Allowance was made in determining ketone excretion for the normal ketone content of rabbit urine. Sugar tolerance and insulin sensitivity tests were performed after a fast of 15 hours. Sugar tolerance was determined by two methods. The single method consisted in one intravenous injection of 5 c.c. of a 20 per cent glucose solution and determination of the blood sugar before and at 5 min. or 10 min. intervals after injection for 50 min. The consecutive method recommended by Himsworth (1934) comprised four intravenous injections of 5 c.c. of a 20 per cent glucose solution at half-hour intervals and estimation of the blood sugar before the first injection and at intervals of 5 min. and 23 min. after each injection. Insulin sensitivity was tested/

tested after the manner of the single sugar tolerance method with the difference that the glucose injection was replaced by 0.5 unit of insulin.

The pancreas of each animal was arbitrarily divided into head, body and tail, fixed in Helly-Zenker solution and embedded in paraffin. Sections were stained by (1) alcoholic eosin and haematoxylin and (2) Heidenhain's iron haematoxylin as recommended by Richardson (1940). The first technique served routine histological purposes, while both methods specifically demonstrated the A- and B-cells of the islet tissue. The weight of islet tissue and the number of islets in each pancreas were calculated after the method described by Ogilvie (1937). The frond-like character of the rabbit pancreas, however, created difficulty in determining its weight. The pancreas and the sheet of mesentery in which it lay were, therefore, carefully dissected out and weighed. The area of the mesentery was measured by laying it upon graph paper and its weight was calculated from that of a known area of mesentery detached from the small intestine. The weight of the pancreas was then obtained by deducting the weight of the mesentery from the combined weights of pancreas and mesentery. A section from head, body and tail of each pancreas was used to determine the percentage area of islet tissue and the number of islets and averages of these quantities were struck for the whole pancreas. An endeavour was thus made to take account of regional variations in the distribution and size of the islets./

islets. Estimation of the area of whole pancreas was rendered difficult by the fact that the fronds of the organ usually occupied only a fraction of each projected field. The fronds had, therefore, to be traced, cut out and weighed so as to obtain an estimate of their combined area. The rabbit pancreas thus involved the tracing of both whole tissue and islets compared with islets alone in the human organ. The microscopical fields used for the estimations were selected according to the size of the paraffin section. Each consecutive field was investigated in a small section, but in a larger piece of tissue the examination was restricted to every second, third, fourth or fifth field. Finally, the conversion of islet volume to islet weight by multiplication of islet volume by 1.05, the density of whole human pancreas, involved the assumption that the islet tissue of rabbit pancreas had the same density as human pancreas. This assumption naturally could not be proved, but the error, if any, was probably small and certainly constant throughout the investigation.

RESULTS.

(1) Glycosuria. This phenomenon was observed in 23 of the 28 injected rabbits (Table 1 and Figs. 3, 5, 7-17, 19-28). It developed as early as the second day of treatment in Rabbit 26, but was delayed until the ninth day in Rabbits 7 and 9 and on/

TABLE I

Rabbit *	Sex	Anterior Pituitary Gland		Glycosuria			Ketonuria		
		Total	Daily **	Appearance	Duration	Peak	Appearance	Duration	Peak
1	M	44.7 g.	Increasing	-	-	-	-	-	-
2	F	29.0 g.	Increasing	-	-	-	-	-	-
3 ††	F	10.2 g.	Constant	Sixth day	1 day	0.07 g. per 24 hr.	-	-	-
4	M	49.9 g.	Increasing	-	-	-	Tenth day	1 day	Not estimated
5	F	51.5 g.	Increasing	Sixth day	15days	5.8 g. per 24 hr.	-	-	-
6	F	61.6 g.	Increasing	-	-	-	Sixth day	† 3 days	Not estimated
7	M	45.1 g.	Increasing	Ninth day	7 days	7.3 g. per 24 hr.	Eighth day	4 days	205 mg. per 24 hr.
8 ††	M	10.7 g.	Constant	Fourth day	3 days	0.05 g. per 24 hr.	Third day	4 days	68 mg. per 24 hr.
9	M	60.7 g.	Increasing	Ninth day	11 days †	15.3 g. per 24 hr.	-	-	-
10	F	67.8 g.	Increasing	Sixth day	10 days	4.3 g. per 24 hr.	Fourth day	† 8 days	544 mg.per 24 hr.
11	F.	60.0 g.	Increasing	Seventh day	14 days	14.8 g. per 24 hr.	Fifth day	† 8 days	609 mg. per 24 hr.
12	F	55.1 g.	Increasing	Fifth day	8 days	4.0 g. per 24 hr.	Sixth day	8 days	1047 mg. per 24 hr.
13	M	52.9 g.	Constant	Sixth day	7 days †	13.6 g. per 24 hr.	Third day	† 8 days	1257 mg. per 24 hr.
14	M	47.5 g.	Constant	Third day	9 days †	10.0 g. per 24 hr.	Sixth day	2 days	61. gm. per 24 hr.
15	M	35.0 g.	Constant	Sixth day	6 days	2.3 g. per 24 hr.	Fourth day	7 days	212. mg. per 24 hr.
17 ††	F	13.1 g.	Constant	Fourth day	1 day	0.1 g. per 24 hr.	Fourth day	3 days	63 mg. per 24 hr.
18	F	41.0 g.	Constant	Eighth day	7 days †	12.3 g. per 24 hr.	Fifth day	1 day	207 mg. per 24 hr.

(Contd.)

20	M	24.2 g.	Constant	-	-	-	-	-	-
21	F	47.2 g.	Constant	Eighth day	8 days	7.9 g.per 24 hr.	-	-	-
22	F	57.6 g.	Constant	Sixth day	12 days	22.6 g. per 24 hr.	Tenth day	4 days	250 gm. per 24 hr.
24	M	57.1 g.	Constant	Fifth day	23 days†	5.5 g.per 24 hr.	Fifth day	5 days†	233 mg. per 24 hr.
25	M	40.9 g.	Constant	Seventh day	7 days†	1.1 g. per 24 hr.	Fifth day	6 days	391 mg. per 24 hr.
26	M	33.2 g.	Constant	Second day	10 days	4.4 g.per 24 hr.	Sixth day	3 days†	695 mg.per 24 hr.
28††	F	23.9 g.	Constant	Sixth day	3 days	1.8 g.per 24 hr.	Fifth day	4 days†	268 mg.per 24 hr.
29	F	35.4 g.	Constant	Seventh day	3 days	2.0 g.per 24 hr.	Eleventh day	2 days	213 mg. per 24 hr.
30	F	28.7 g.	Constant	Sixth day	7 days	4.0 g.per 24 hr.	Eighth day	2 days	15 mg. per 24 hr.
31	F	32.0 g.	Constant	Third day	10 days	32.7 g.per 24 hr.	Eighth day	4 days	1706 mg. per 24 hr.
32	M	35.3 g.	Constant	Third day	9 days	27.5 g.per 24 hr.	-	-	-

* Rabbits 1 - 3 were injected intraperitoneally and Rabbits 4 - 32 subcutaneously.

** The terms <u>constant</u> and <u>increasing</u> have the significance defined above under Methods (Extract).

† These periods included occasional days during which no sugar or ketones were present in the urine.

†† These rabbits died before complete sugar and ketone curves were obtained.

on the average manifested itself on the sixth day. After it appeared, the glycosuria rose to a peak and subsequently fell to zero and this type of response was observed both in animals which received a constant daily amount of extract and in those injected with extract which was increased at short intervals to an equivalent of as much as 2.5 g. gland per kg. body weight. The ingravescent stage was rapid throughout in most animals, but in almost as many cases an initial slow phase preceded a rapid rise to the peak. The peak was characteristically followed by a rapid disappearance of sugar from the urine, while in the remaining cases the sugar subsided less rapidly or even slowly or rapidly at first and later slowly. The peak lay between the sixth and twenty-second day of treatment in the case of Rabbits 12 and 24 respectively and on the average occurred on the eleventh day. The height of the peak varied within wide limits. Thus, considering merely those animals which gave a complete sugar curve Rabbit 25 excreted at most only 1.1 g. sugar per 24 hr., while Rabbit 31 passed as much as 32.7 g. sugar per 24 hr. The animals which received constant extract passed an average maximum of 11.2 g. sugar per 24 hr. against 8.6 g. per 24 hr. as an average maximum for those injected with increasing extract and the average sugar excretion for the entire series was 10.4 g. per 24 hr. Sugar was excreted over a period of between three days for Rabbit 29 and twenty-three days for Rabbit 24.

The/

The excretion of sugar by Rabbit 24, however, was relatively slight for more than a fortnight and punctuated by occasional sugar-free days. The longest period of continuous glycosuria was fifteen days in the case of Rabbit 5. The animals receiving constant extract excreted sugar on the average for nine days against eleven days on the average for the animals injected with increasing extract and the average duration of sugar excretion for the series was 9.6 days. The average glycosuric curve thus began on the sixth day of treatment, reached a peak of 10.4 g. sugar per 24 hr. on the eleventh day and returned to zero on the sixteenth day. Eighteen rabbits which showed glycosuria also excreted ketones. The excretion of sugar anticipated the appearance of ketones by a period of one to five days or an average of three days in 7 animals, while in 9 animals sugar did not become positive until a period of one to three days or an average of two days after ketones and 2 animals exhibited both sugar and ketones on the same day.

(2) Ketonuria. This phenomenon was observed in 20 of the 28 injected animals (Table 1, and Figs. 4, 6-8, 10-17, 20-27). It developed between the third day in Rabbits 8 and 13 and the eleventh day in Rabbit 29 and on the sixth day on the average. The excretion of ketones rose to a peak and thereafter fell to zero and such a rise and fall occurred both in the animals receiving constant extract and in those injected/

injected with increasing extract. The increase in ketone excretion was uniformly rapid in most animals, but in some it was slow initially and later rapid or proceeded throughout at a medium rate. Similarly, the decline of ketone excretion was, as a rule, uniformly rapid, although sometimes rapid at first and later more slow or occasionally throughout of medium pace. Ketone excretion reached its peak between the fifth day for Rabbit 18 and the eleventh day for Rabbits 7, 29 and 31 and on the eight day on the average for the animals in which complete ketonuric curves were obtained. The height of the peak varied within wide limits. Thus, Rabbit 30 excreted only 15 mg. ketones per 24 hr. at most, while at the peak of its curve, Rabbit 31 passed 1706 mg. ketones per 24 hr. The animals injected with constant extract passed an average maximum of 476 mg. ketones per 24 hr. compared with 601 mg. ketones per 24 hr. for those receiving increasing extract and the average peak for the series was 510 mg. per 24 hr. The period over which ketones were excreted also varied considerably. Thus, whereas it lasted for only one day in Rabbits 4 and 18, ketonuria continued with or without occasional ketone-free days for eight days in Rabbits 10,11, 12 and 13. The animals injected with constant extract excreted ketones for an average of four days against slightly more than five days for the animals receiving increasing extract and the average period of ketonuria for the series was 4.5 days/

days. The average curve of ketone excretion thus began on the sixth day of treatment, attained a maximum of 510 mg. per 24 hr. by the eigth day and returned to normal slightly later than the tenth day of injection. Eighteen of the rabbits, as already mentioned, excreted both ketones and sugar.

(3) Re-injection. Three rabbits which had shown transitory phases of glycosuria and ketonuria were re-injected after they had regained their strength. Rabbit 14 (Fig. 14) received 32.2 g. gland in constant daily amounts of 1.5 g. gland per kg. body weight between the sixth and sixteenth days and excreted sugar and ketones for nine days and two days respectively. Re-injection consisted in the administration of 15.3 g. gland in daily quantities of the same magnitude between the thirty-seventh and forth-second days. Rabbit 10 (Fig.10) received 41.7 g. gland between the tenth and twenty-fourth days and the daily amount in this case was increased at intervals of five days from 1 g. per kg. to 2 g. per kg. Sugar and ketones were excreted for ten and eight days respectively. The animal was re-injected between the fifty-third and sixty-second days of the experiment and given 26.1 g. gland in daily amounts which were increased after five days from 1 g. per kg. to 1.5 g. per kg. Re-injection of Rabbits 14 and 10 covered the period within which both had previously developed glycosuria and ketonuria, yet no sugar or ketones appeared in the urine of either of them/

them as a result of the second course of treatment. Rabbit 12 was given 55.1 g. gland in increasing daily amounts between the tenth and twenty-fifth days of the experiment and showed transitory phases of glycosuria and ketonuria. A second course of treatment was started on the fifty-eighth day, but the animal about a minute after the first injection died in a collapsed, dyspnoeic condition.

(4) Sugar Tolerance. (a) Single method. Eight rabbits were investigated from the point of view of sugar tolerance by the single method above described. The test was carried out in the normal animal and also during and after the diabetic phase in two rabbits, while in the remainder it was performed in the intact animal and either during or after the glycosuric period. The results are given in Table II and collectively illustrated by Fig. 29. The curve of normal sugar tolerance based on the average of eight rabbits rises swiftly from a fasting level of 131 mg. per cent to a peak of 268 mg. per cent in 5 minutes. The blood sugar then falls at a uniformly rapid rate to 202 mg. per cent at 20 minutes. The difference in the levels of the blood sugar at 20 and 30 minutes is 33 mg. compared with 50 mg. for the previous 10 minutes so that the rate of fall between 20 and 30 minutes shows a definite decrease. The blood sugar after 30 minutes continues to fall at a uniformly moderate rate to reach 129 mg. at 50 minutes. Based on the average/

10 a.

TABLE II

SUGAR TOLERANCE - SINGLE METHOD

Rabbit	Stage	BLOOD SUGAR in mg. per cent								
		Fasting	5 min.	10 min.	15 min	20 min	25 min	30 min	40 min	50 min
24	Control	126	298	286	270	250	235*	214	183†	156†
	Diabetes	140	311	286	280*	276	264	260	260	260*
	Recovery	-	-	-	-	-	-	-	-	-
25	Control	103	235	207	178**	158*	138**	126	114	101†
	Diabetes	140	228	207	201*	185*	178	178	183	183
	Recovery	-	-	-	-	-	-	-	-	-
26	Control	133	282	241	212	190*	169	158	138	124
	Diabetes	209	311	304	296	284	270	270	270	256††
	Recovery	-	-	-	-	-	-	-	-	-
28	Control	158	272	256	230	224	203	194	163	151
	Diabetes	222	321	296	272	262	245	243	239	239
	Recovery	-	-	-	-	-	-	-	-	-
29	Control	133	249	239	212	194*	176	162	145	140
	Diabetes	-	-	-	-	-	-	-	-	-
	Recovery	121	230*	215*	201	174*	153†	140*	119*	109*
30	Control	114	249	231	212	187	171	140	119	107
	Diabetes	168	311	294	276	262	254	242	235	230
	Recovery	-	-	-	-	-	-	-	-	-
31	Control	160	295	270	252	226	218*	194	158	128
	Diabetes	203	338	306	278	258	239	235	230	225
	Recovery	130	296	252	212	184†	162*	148	119*	99
32	Control	117	260	256	218	187	176	160	142	128
	Diabetes	135	282	260	251*	226	211	203	194	185
	Recovery	96	192*	176	158	133†	124	121	105	96*
Averages	Control	131	268	248	223	202	186	169	145	129
	Diabetes	174	300	279	265	250	237	233	230	225
	Recovery	116	239	214	190	164	146	136	114	101

* + 1 minute   ** + 3 minutes

† + 2 minutes   †† + 5 minutes

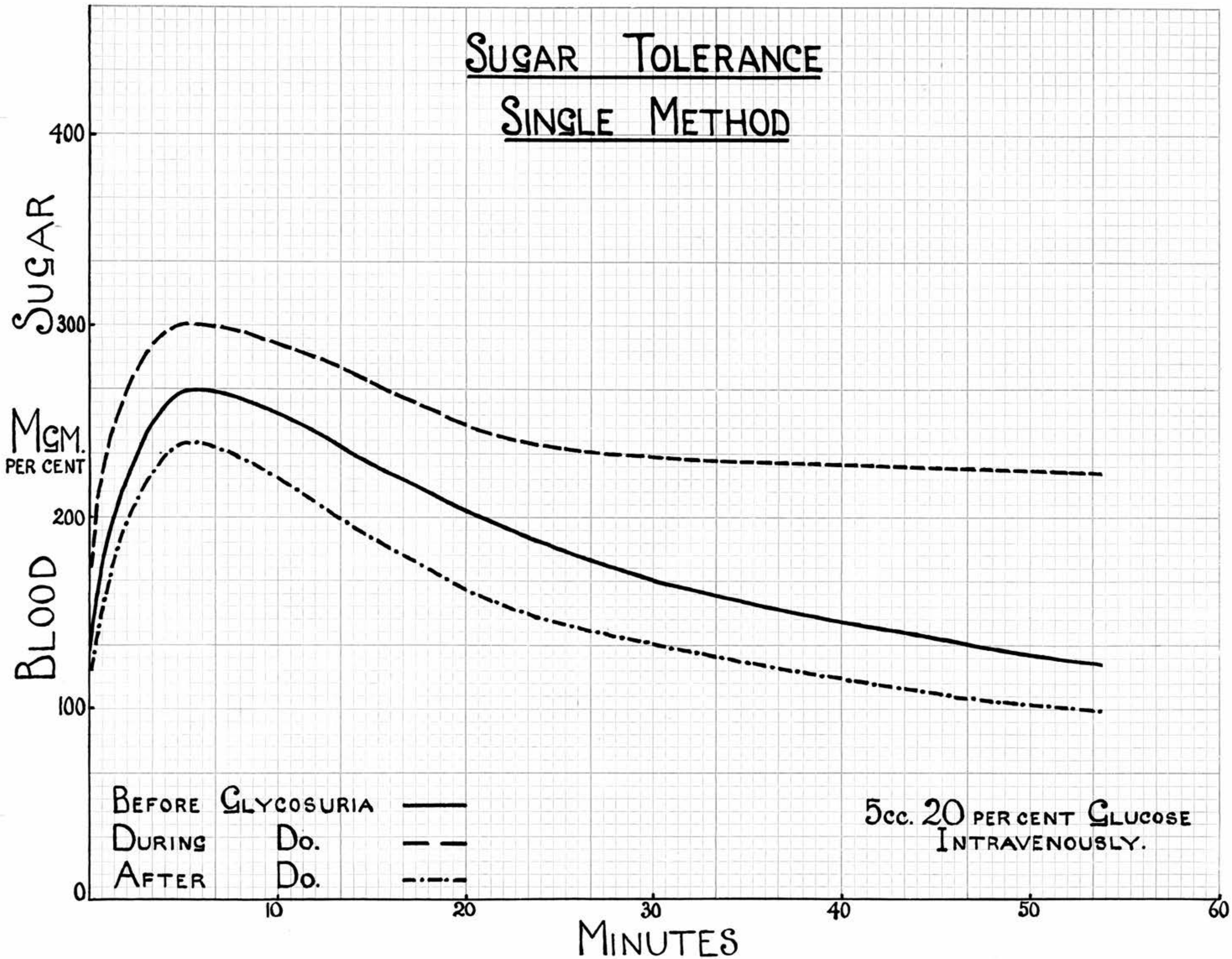

Sugar Tolerance
Single Method
Blood Sugar
Mgm. per cent
400
300
200
100
0
10
20
30
40
50
60
Minutes
Before Glycosuria
During Do.
After Do.
5cc. 20 per cent Glucose
Intravenously.

Figure 29.

average of seven rabbits, the curve of sugar tolerance <u>during</u> the diabetic phase begins at a fasting level of 174 mg. per cent which is 43 mg. per cent more than the average normal fasting level. Its peak of 300 mg. per cent at 5 minutes is also 32 mg. per cent higher than that of the control curve, although a rise of only 126 mg. per cent compared with 137 mg. per cent for the normal curve suggests that some of the original peaks have been missed. The curve of the diabetic phase thereafter declines at a rate comparable with the normal to reach 250 mg. per cent at 20 minutes. The fall in blood sugar between 20 and 30 minutes is only 17 mg. per cent compared with 35 mg. per cent for the previous 10 minutes and 33 mg. per cent during the same period of the normal curve. The blood sugar between 20 and 30 minutes, therefore, falls not only at an abnormally reduced rate compared with its previous speed, but also at about half the rate of the normal curve. The fall in blood sugar between 30 and 50 minutes is only 8 mg. per cent against a normal decline of 40 mg. per cent and compared with the normal the blood sugar at 50 minutes is higher by 100 mg. per cent. The rate of absorption during this final period consequently shows a marked progressive diminution and is, indeed, reduced to one-eighth of the normal. Thus, the sugar tolerance curve of the diabetic phase is during the first 20 minutes of the test similar to that of normal tolerance at a higher level, while it falls at only half the normal rate between/

between 20 and 30 minutes and between 30 and 50 minutes at only one-eigth of the normal. The result is that at the end of the test the blood sugar remains higher than the control level by as much as 100 mg. per cent. Based on the average of three rabbits, the curve of sugar tolerance after the diabetic phase is similar to that of normal tolerance except that it is placed at a lower level. Its lower level is probably explained by the fact that the animals have become accustomed to manipulative measures such as would tend to stimulate the sympathetic nervous system and produce hyperglycaemia during the earlier tests. Sugar tolerance after the diabetic phase may, therefore, be regarded as again of normal order.

(b) Consecutive method. The sugar tolerance of five rabbits was investigated by this method. Each animal was tested in the control stage and also during and/or after the diabetic phase. The results are set forth in Table III and illustrated by Fig. 30. The curve of normal sugar tolerance is based on the average of figures obtained from Rabbits 7, 10 and 11 and takes the form of an alternately rising and falling line, the trend of which is on the average slightly downward. Two of the three component graphs show more clearly this falling character, but the third definitely rises and so masks the effect of the others. The interpretation of the average falling graph is that each of the last three amounts of glucose injected intravenously has been removed from the circulation/

T A B L E III

SUGAR TOLERANCE - CONSECUTIVE METHOD

bit	Stage	BLOOD SUGAR in mg. per cent								
		Fasting	5min	28min	35min	58min	65min	88min	95min	118mi
	Control	110	274	163	270	151	264	133	254	160
	Diabetes	-	-	-	-	-	-	-	-	-
	Recovery *	98	218	154	231	156	313	169	349	170
	Control	-	-	-	-	-	-	-	-	-
	Diabetes	-	-	-	-	-	-	-	-	-
	Recovery †	110	214	147	239	156	264	163	266	174
	Control	131	268	205	224	131	189	169	201	172
	Diabetes	191	289	236	330	255	340	312	408	316
	Recovery	122	262	192	278	171	239	144	258	140
	Control	129	282	212	345	224	351	230	363	224
	Diabetes	171	306	252	395	311	452	306	513	345
	Recovery	119	268	183	315	199	319	203	306	172
**	Control	105	499	282	556	360	520	385	454	345
	Diabetes	-	-	-	-	-	-	-	-	-
	Recovery	101	463	245	494	286	509	247	539	296
	Control	123	275	193	280	169	268	177	273	185
ages , 9 11	Diabetes	181	298	244	363	283	396	309	461	331
	Recovery ††	121	265	188	297	185	279	174	282	156

* Performed one day after last day of glycosuria.

† Performed two days after last day of glycosuria.

** This animal received four half-hourly injections of 5 c.c. of a 100 per cent glucose solution instead of 5 c.c. of a 20 per cent glucose solution as in Rabbits 7, 9, 10 and 11.

†† Average of 10 and 11 only.

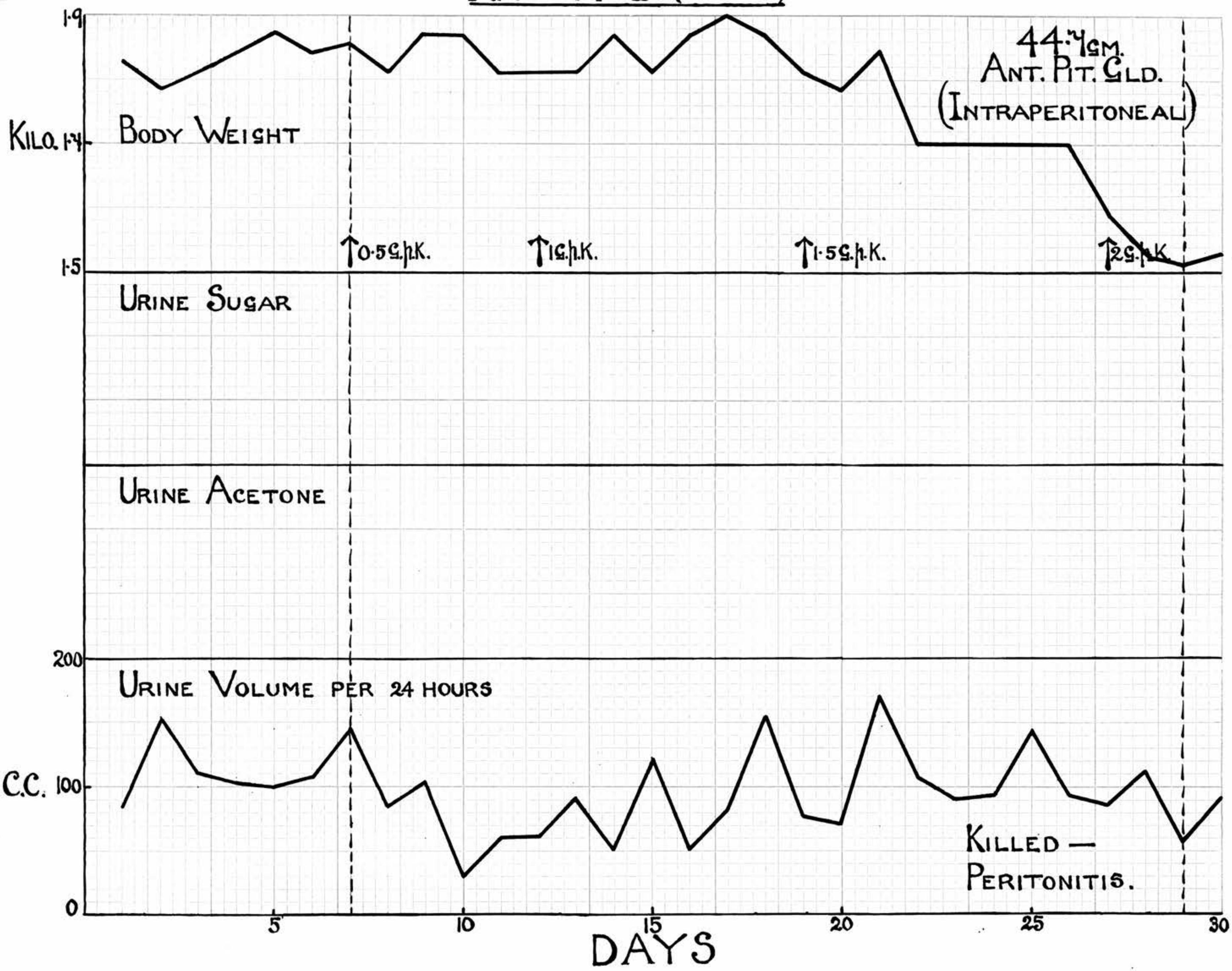

44.4 GM.
ANT. PIT. GLD.
(INTRAPERITONEAL)
KILO. 1.4
1.9
1.5
BODY WEIGHT
↑0.5 G.p.K.
↑1 G.p.K.
↑1.5 G.p.K.
↑2 G.p.K.
URINE SUGAR
URINE ACETONE
200
C.C. 100
0
URINE VOLUME PER 24 HOURS
KILLED —
PERITONITIS.
5
10
15
20
25
30
DAYS

Figure 1.

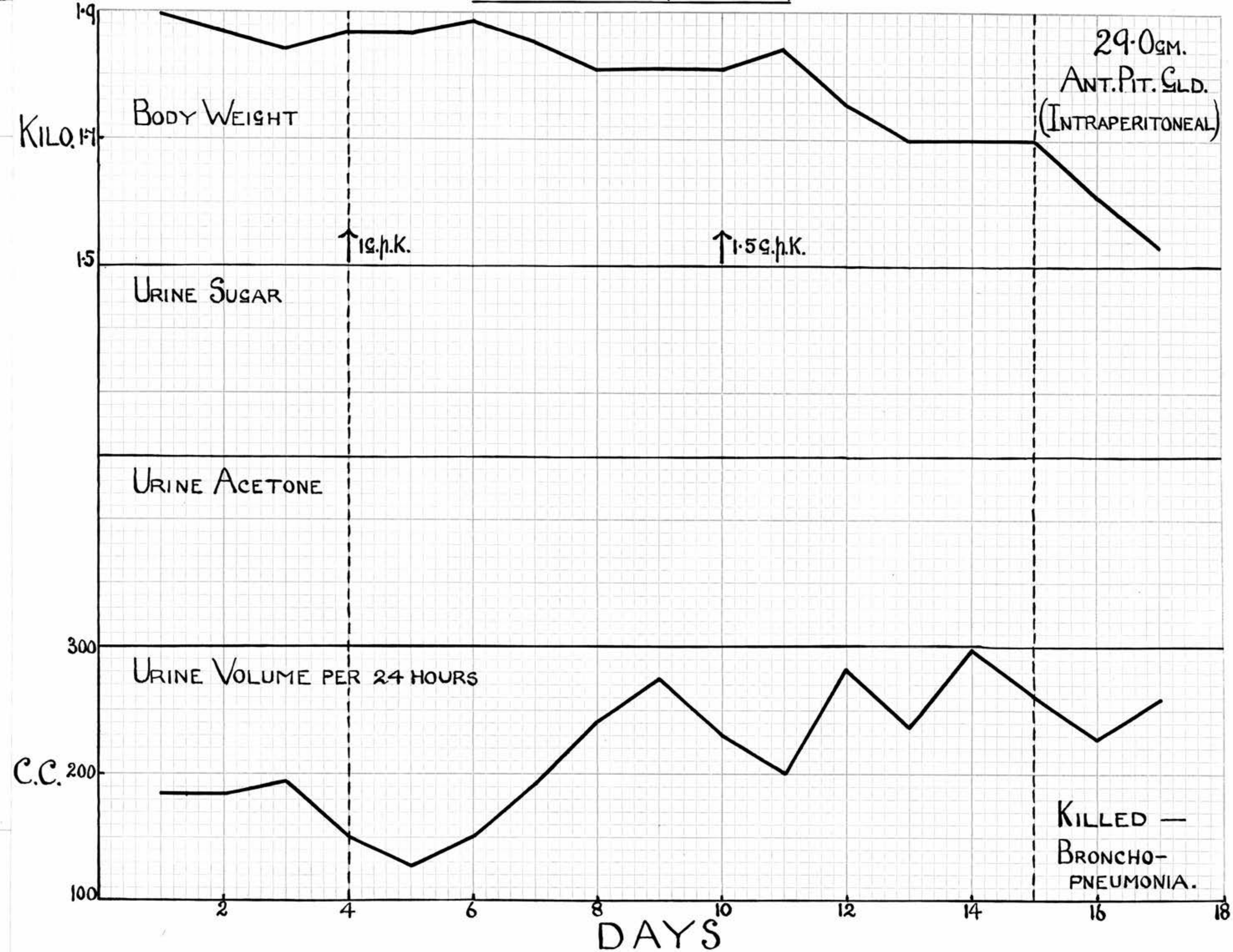
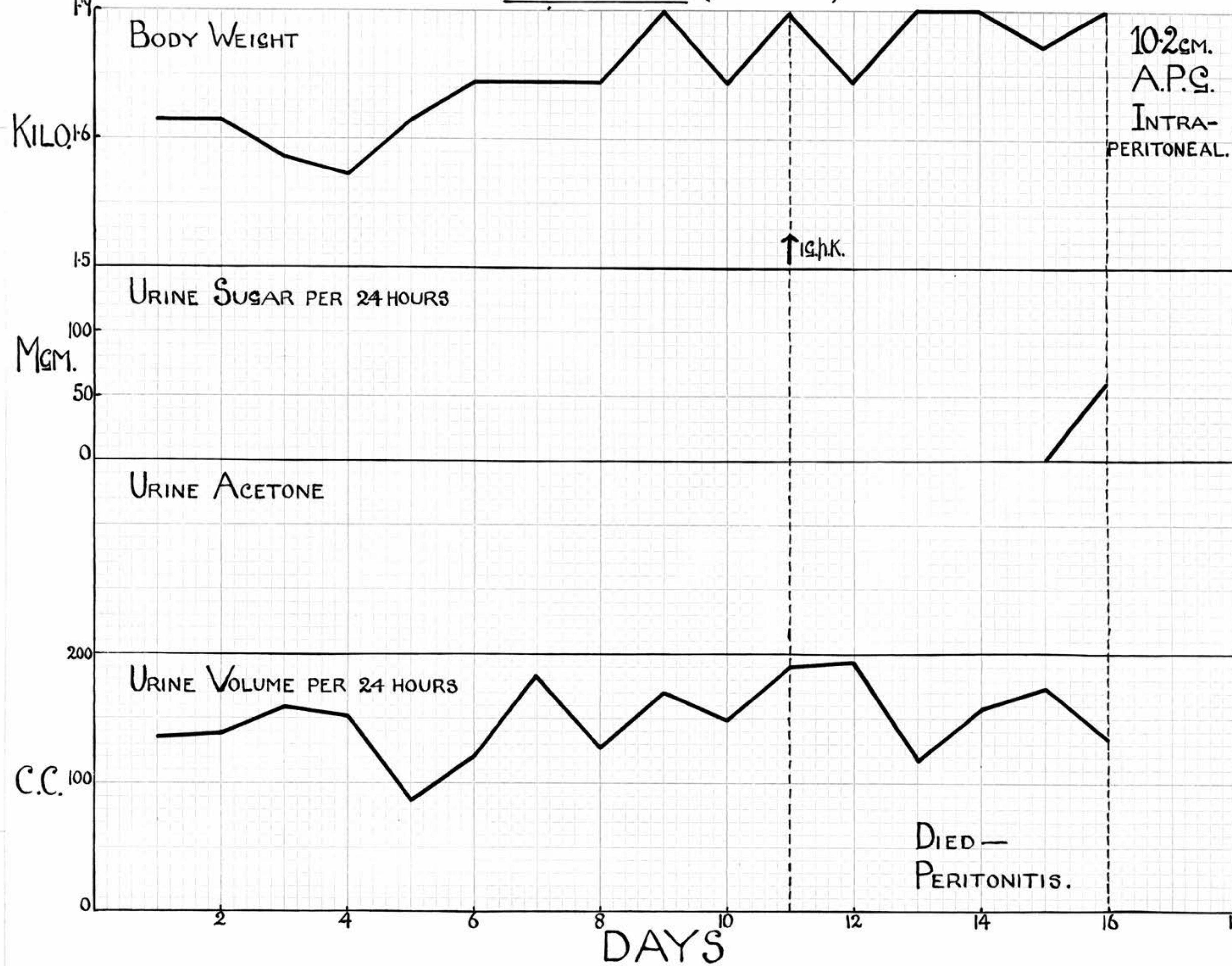

29·0gm.
Ant. Pit. Gld.
(Intraperitoneal)
Body Weight
Kilo. 1·9
1·7
1·5
↑1g.p.K.
↑1·5g.p.K.
Urine Sugar
Urine Acetone
Urine Volume per 24 hours
C.C. 300
200
100
Killed —
Broncho-
pneumonia.
2
4
6
8
10
12
14
16
18
DAYS

Figure 2.



Body Weight
Kilo. 1·6
1·7
1·5
Urine Sugar per 24 hours
Mgm.
100
50
0
Urine Acetone
Urine Volume per 24 hours
C.C. 100
200
0
2
4
6
8
10
12
14
16
18
Days
15 gh.K.
10·2 gm. A.P.G. Intra-peritoneal.
Died — Peritonitis.

Figure 3.

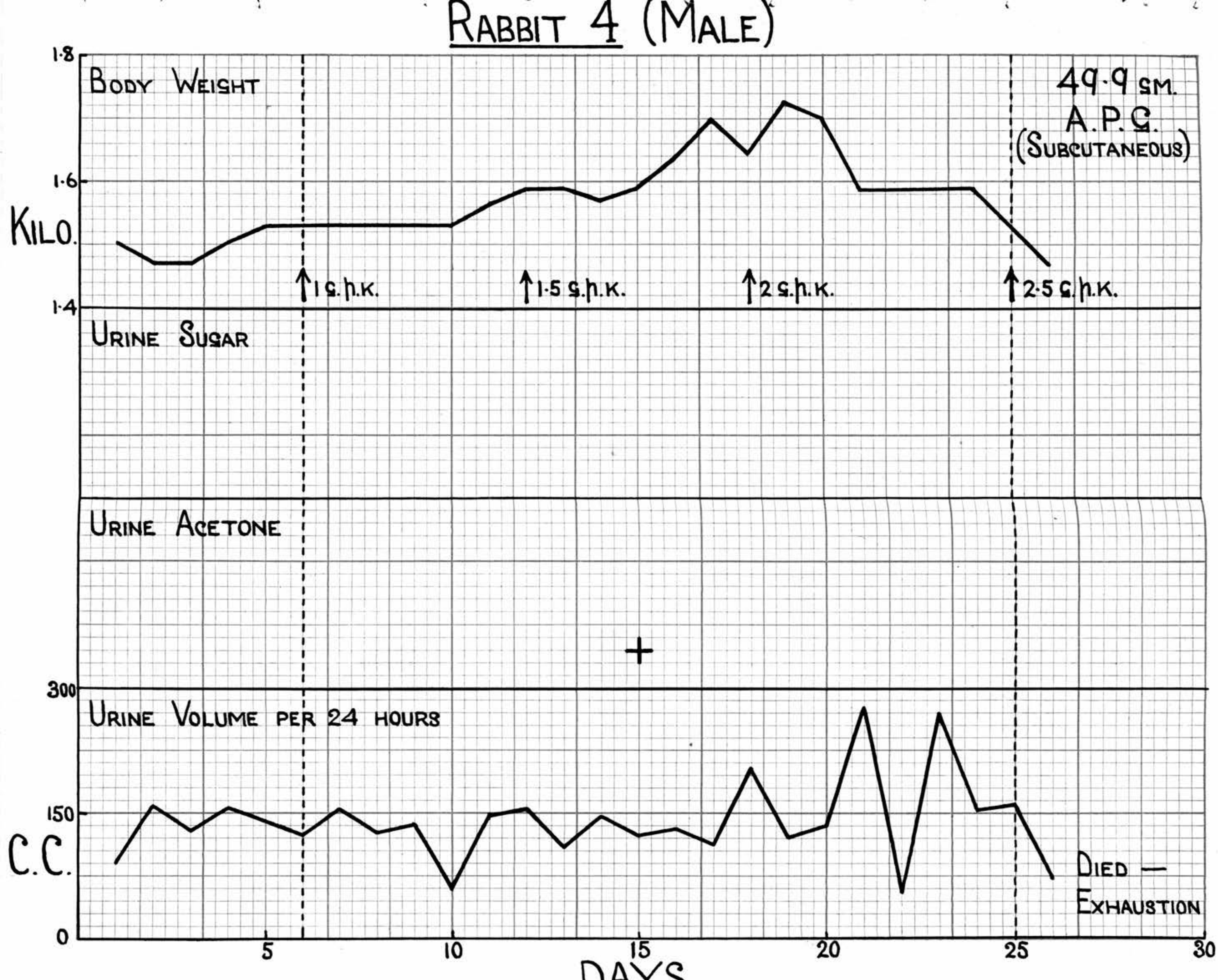

Rabbit 4 (Male)
Body Weight
49·9 gm.
A.P.G.
(Subcutaneous)
1·8
1·6
1·4
Kilo.
↑1 g.p.k.
↑1·5 g.p.k.
↑2 g.p.k.
↑2·5 g.p.k.
Urine Sugar
Urine Acetone
+
Urine Volume per 24 hours
300
150
0
C.C.
Died —
Exhaustion
5
10
15
20
25
30
Days

Figure 4.

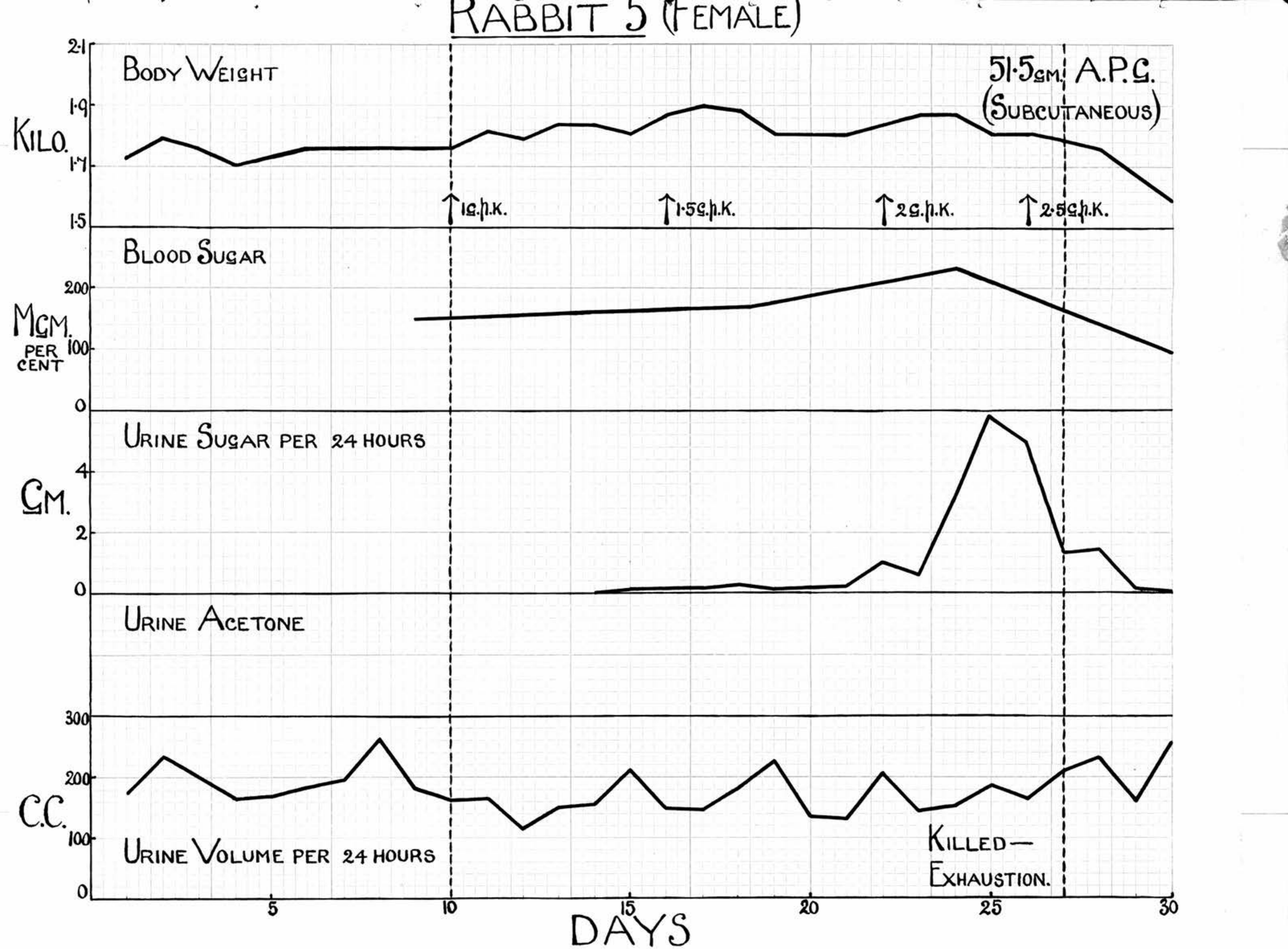
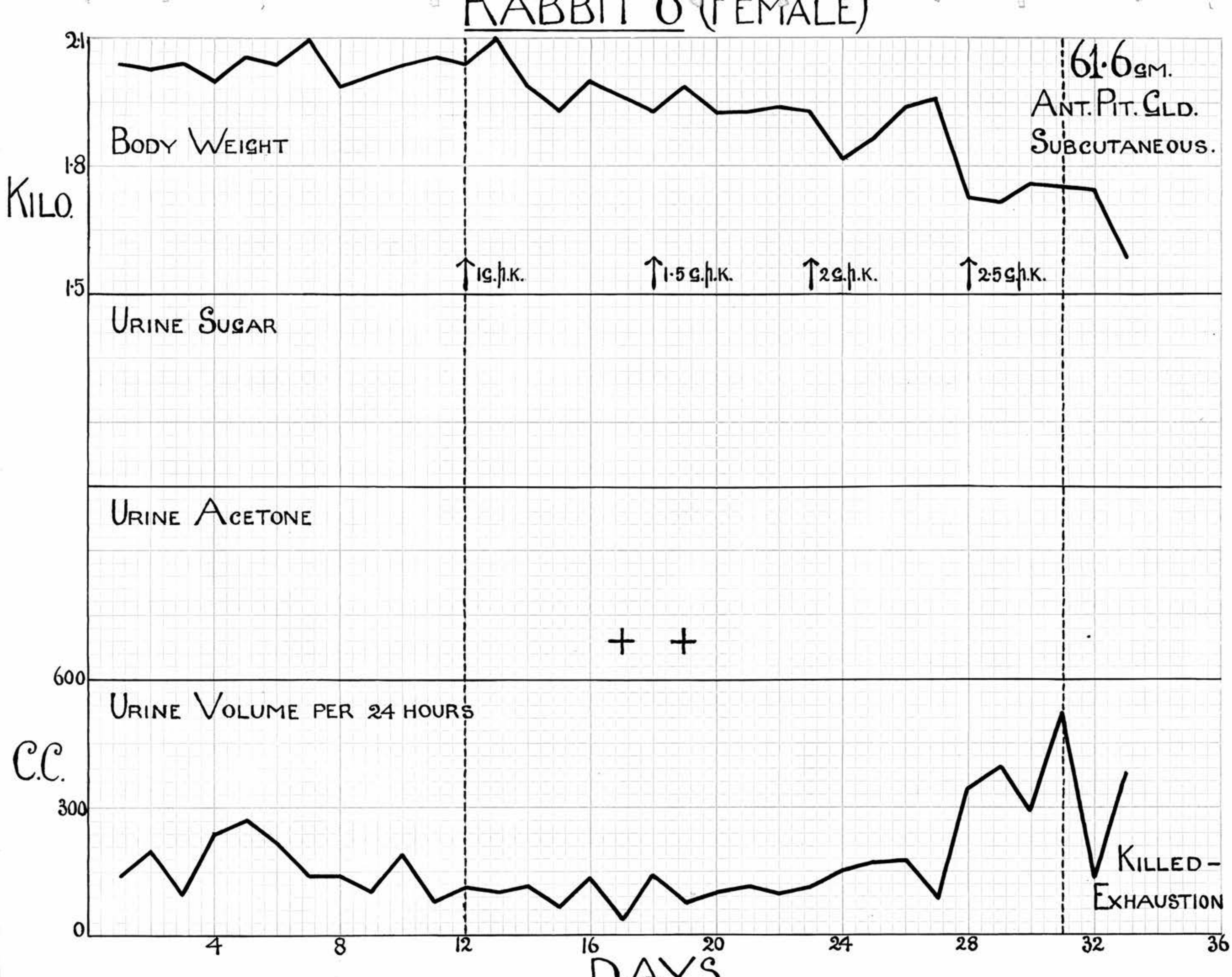

RABBIT 5 (FEMALE)
BODY WEIGHT
KILO.
2·1
1·9
1·7
1·5
51·5 GM. A.P.G.
(SUBCUTANEOUS)
1 G. P.K.
1·5 G. P.K.
2 G. P.K.
2·5 G. P.K.
BLOOD SUGAR
MGM. PER CENT
200
100
0
URINE SUGAR PER 24 HOURS
GM.
4
2
0
URINE ACETONE
300
200
100
0
C.C.
URINE VOLUME PER 24 HOURS
KILLED — EXHAUSTION.
5
10
15
20
25
30
DAYS

Figure 5.



RABBIT 6 (FEMALE)
BODY WEIGHT
URINE SUGAR
URINE ACETONE
URINE VOLUME PER 24 HOURS
KILO.
C.C.
2·1
1·8
1·5
600
300
0
↑1g.p.K.
↑1·5 g.p.K.
↑2g.p.K.
↑2·5g.p.K.
+ +
61·6gm.
ANT. PIT. GLD.
SUBCUTANEOUS.
KILLED -
EXHAUSTION
4
8
12
16
20
24
28
32
36
DAYS

Figure 6.

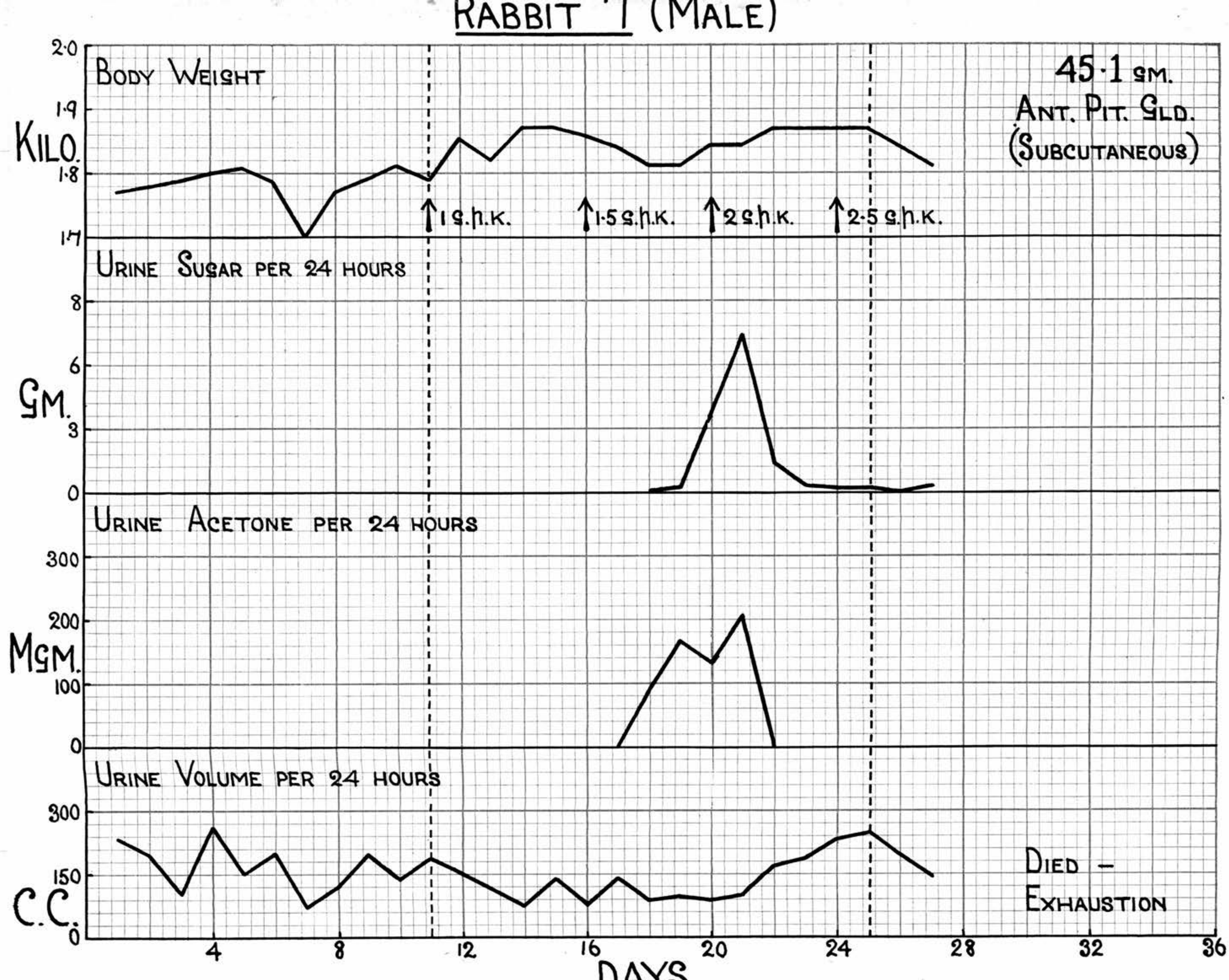

RABBIT 'I' (MALE)
BODY WEIGHT
45·1 GM.
ANT. PIT. GLD.
(SUBCUTANEOUS)
KILO.
2·0
1·9
1·8
1·7
1 G.H.K.
1·5 G.H.K.
2 G.H.K.
2·5 G.H.K.
URINE SUGAR PER 24 HOURS
GM.
8
6
3
0
URINE ACETONE PER 24 HOURS
MGM.
300
200
100
0
URINE VOLUME PER 24 HOURS
C.C.
300
150
0
DIED -
EXHAUSTION
4
8
12
16
20
24
28
32
36
DAYS

Figure 7.

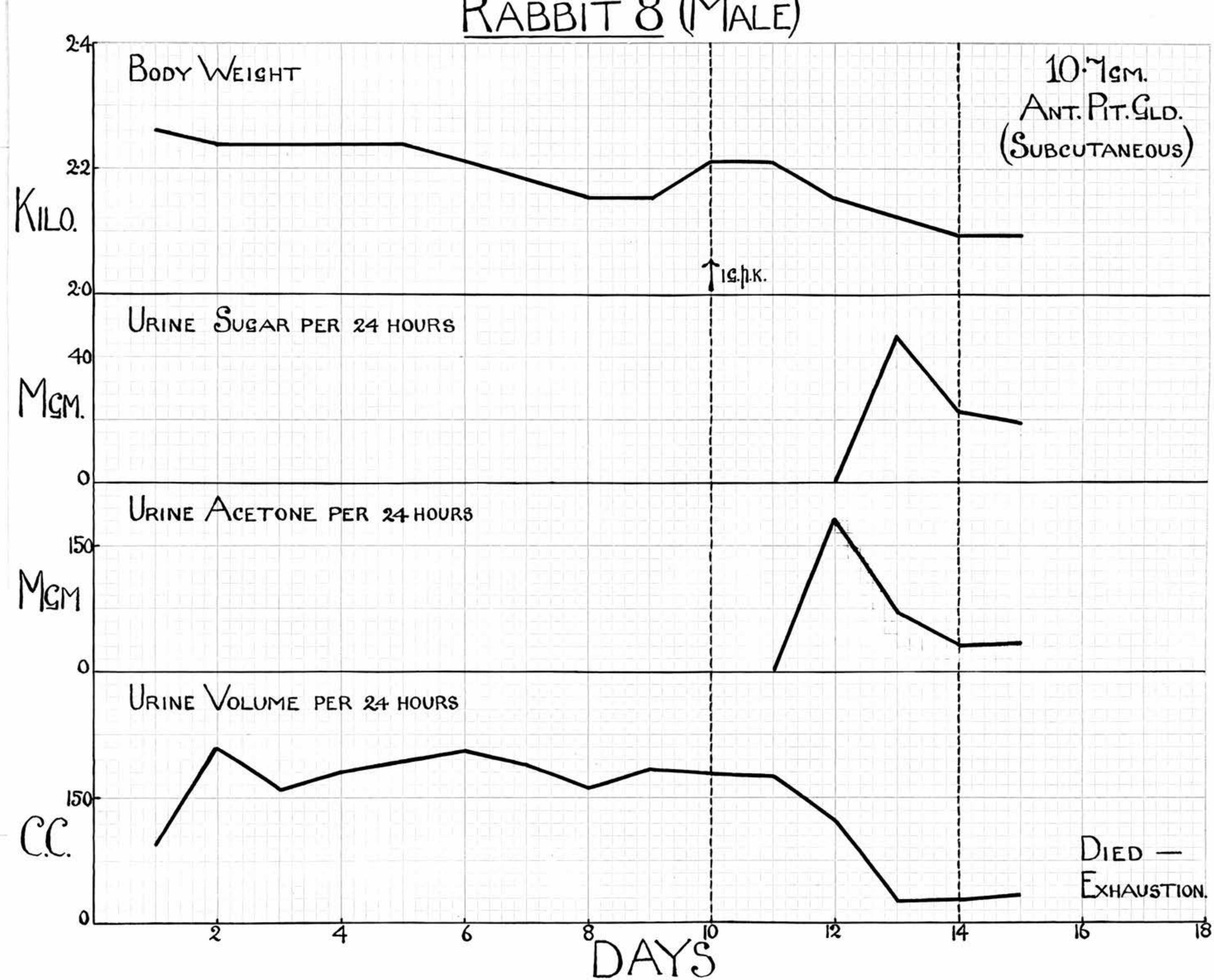

RABBIT 8 (MALE)
BODY WEIGHT
10·7 GM.
ANT. PIT. GLD.
(SUBCUTANEOUS)
KILO.
2·4
2·2
2·0
↑1G.P.K.
URINE SUGAR PER 24 HOURS
40
MGM.
0
URINE ACETONE PER 24 HOURS
150
MGM
0
URINE VOLUME PER 24 HOURS
150
C.C.
0
DIED —
EXHAUSTION.
2
4
6
8
10
12
14
16
18
DAYS

Figure 8.

RABBIT 9 (MALE)

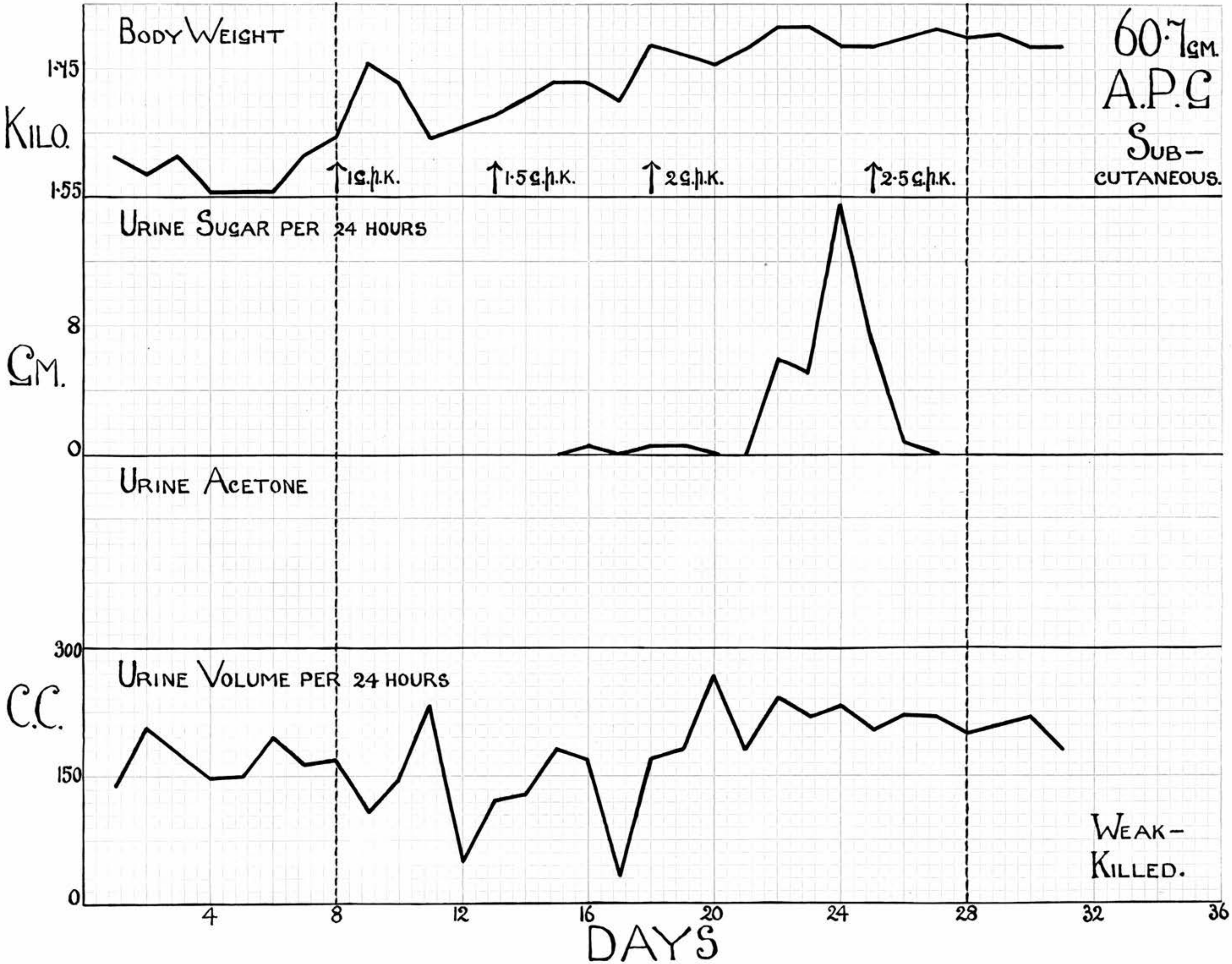


Figure 9.

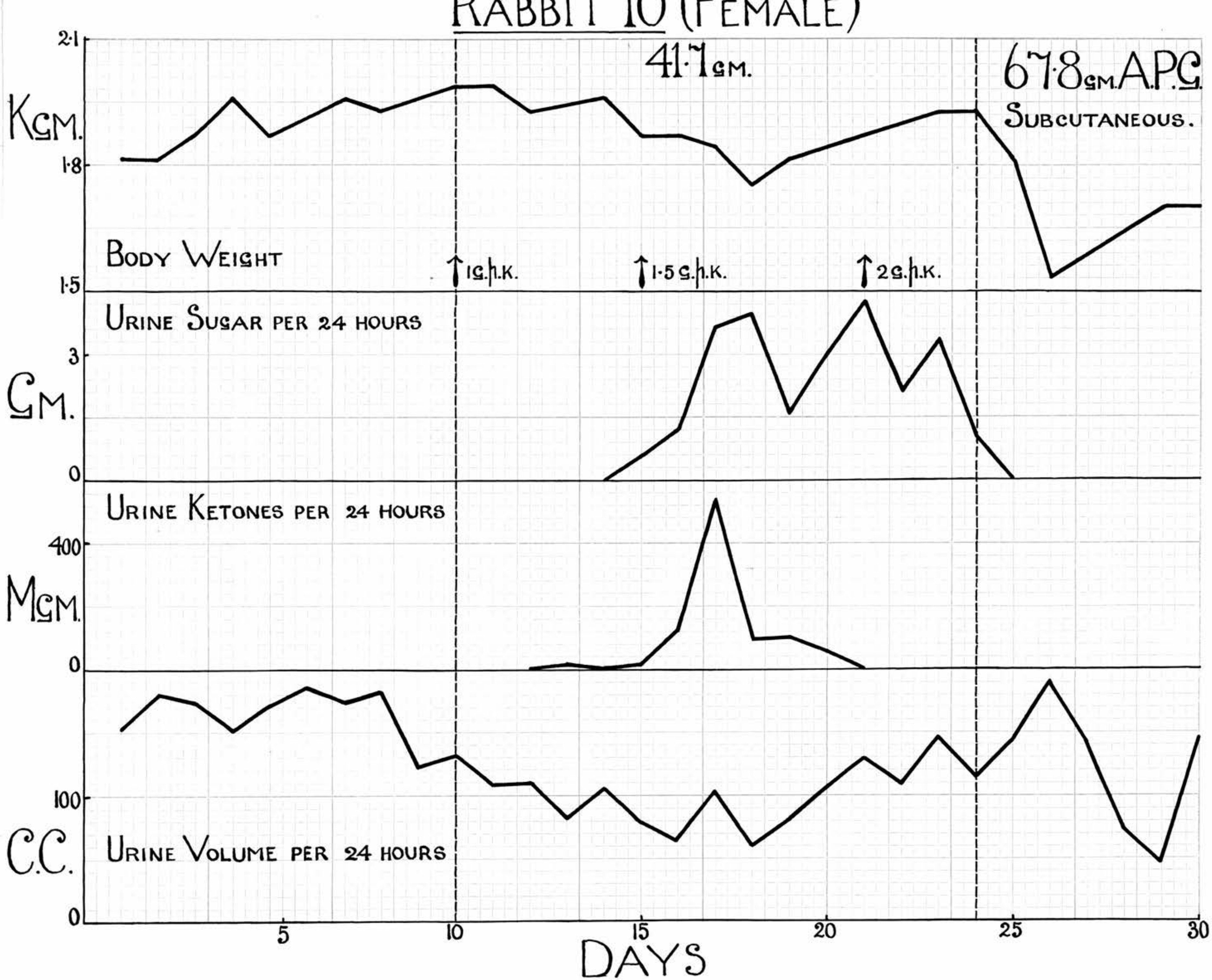
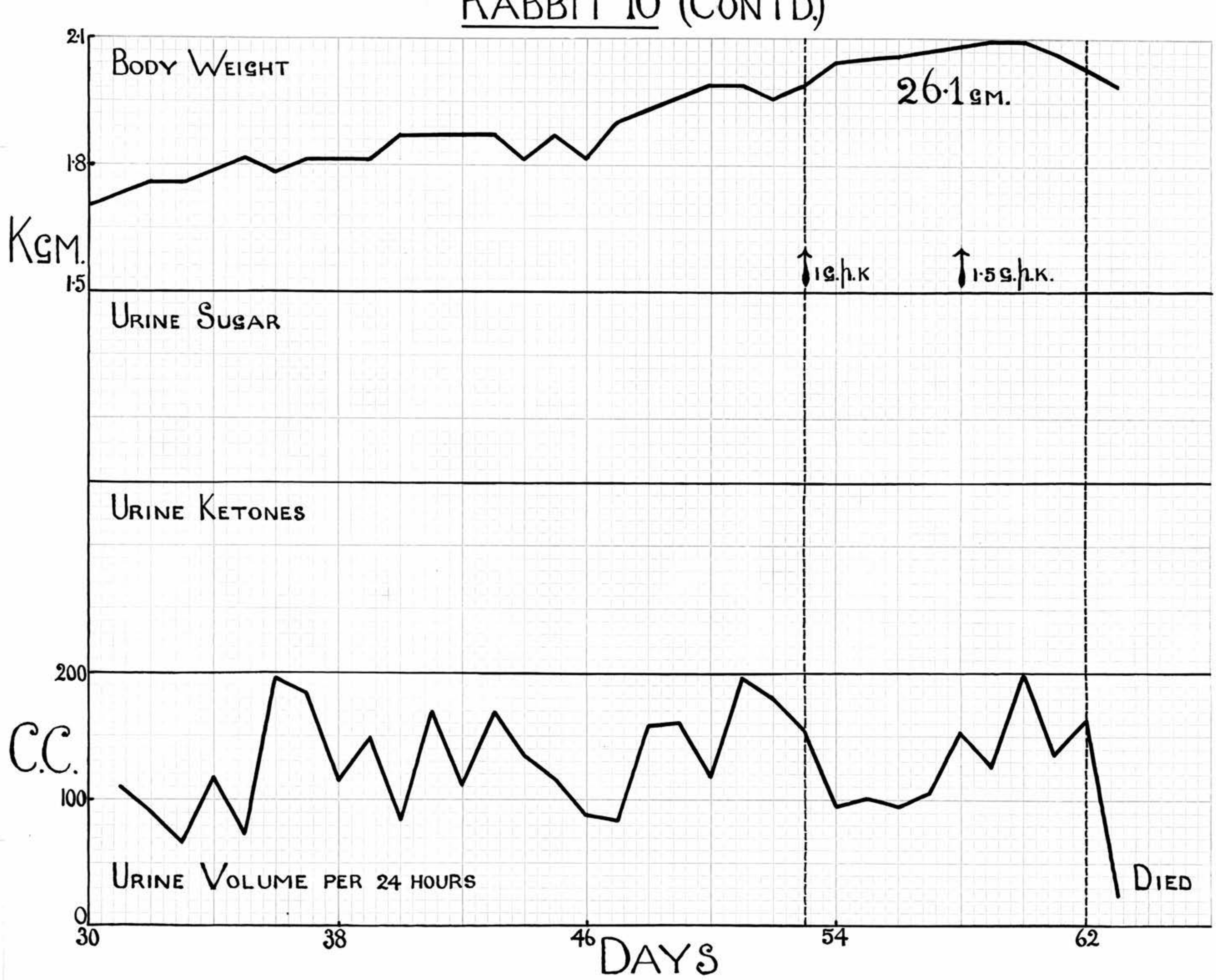
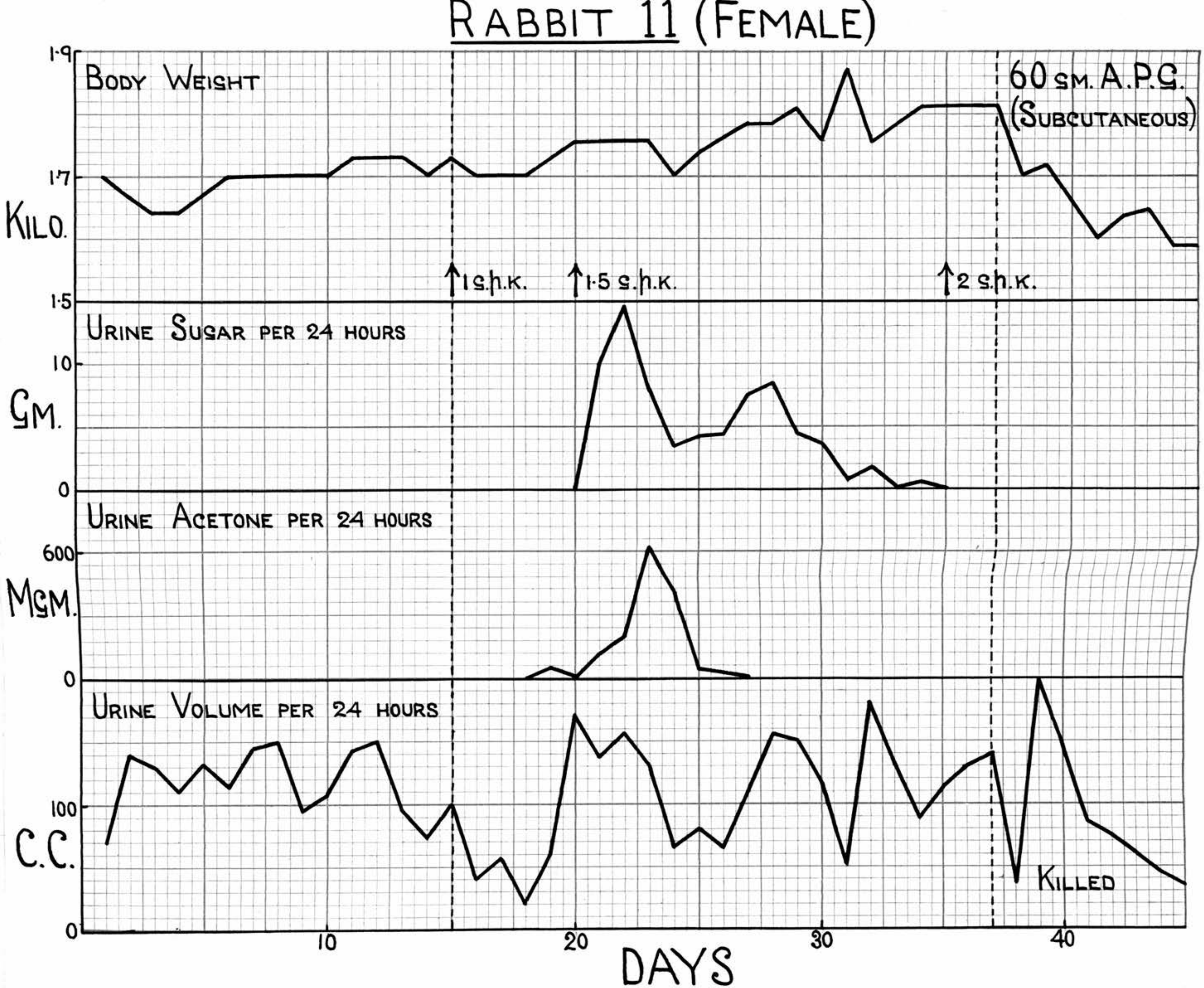

RABBIT 10 (FEMALE)
41·7 GM.
67·8 GM. A.P.G.
SUBCUTANEOUS.
KGM.
2·1
1·8
1·5
BODY WEIGHT
↑1 G. p.K.
↑1·5 G. p.K.
↑2 G. p.K.
URINE SUGAR PER 24 HOURS
GM.
3
0
URINE KETONES PER 24 HOURS
MGM.
400
0
URINE VOLUME PER 24 HOURS
C.C.
100
0
5
10
15
20
25
30
DAYS

Figure 10.



RABBIT 10 (CONTD.)
BODY WEIGHT
KGM.
2·1
1·8
1·5
26·1GM.
1G.P.K
1·5G.P.K.
URINE SUGAR
URINE KETONES
URINE VOLUME PER 24 HOURS
C.C.
200
100
0
DIED
30
38
46
54
62
DAYS

Figure 10.



RABBIT 11 (FEMALE)
BODY WEIGHT
60 gm. A.P.G.
(SUBCUTANEOUS)
1·9
1·7
KILO.
1·5
↑1 g.h.k.
↑1·5 g.h.k.
↑2 g.h.k.
URINE SUGAR PER 24 HOURS
15
10
GM.
0
URINE ACETONE PER 24 HOURS
600
MGM.
0
URINE VOLUME PER 24 HOURS
100
C.C.
0
KILLED
10
20
30
40
DAYS

Figure 11.

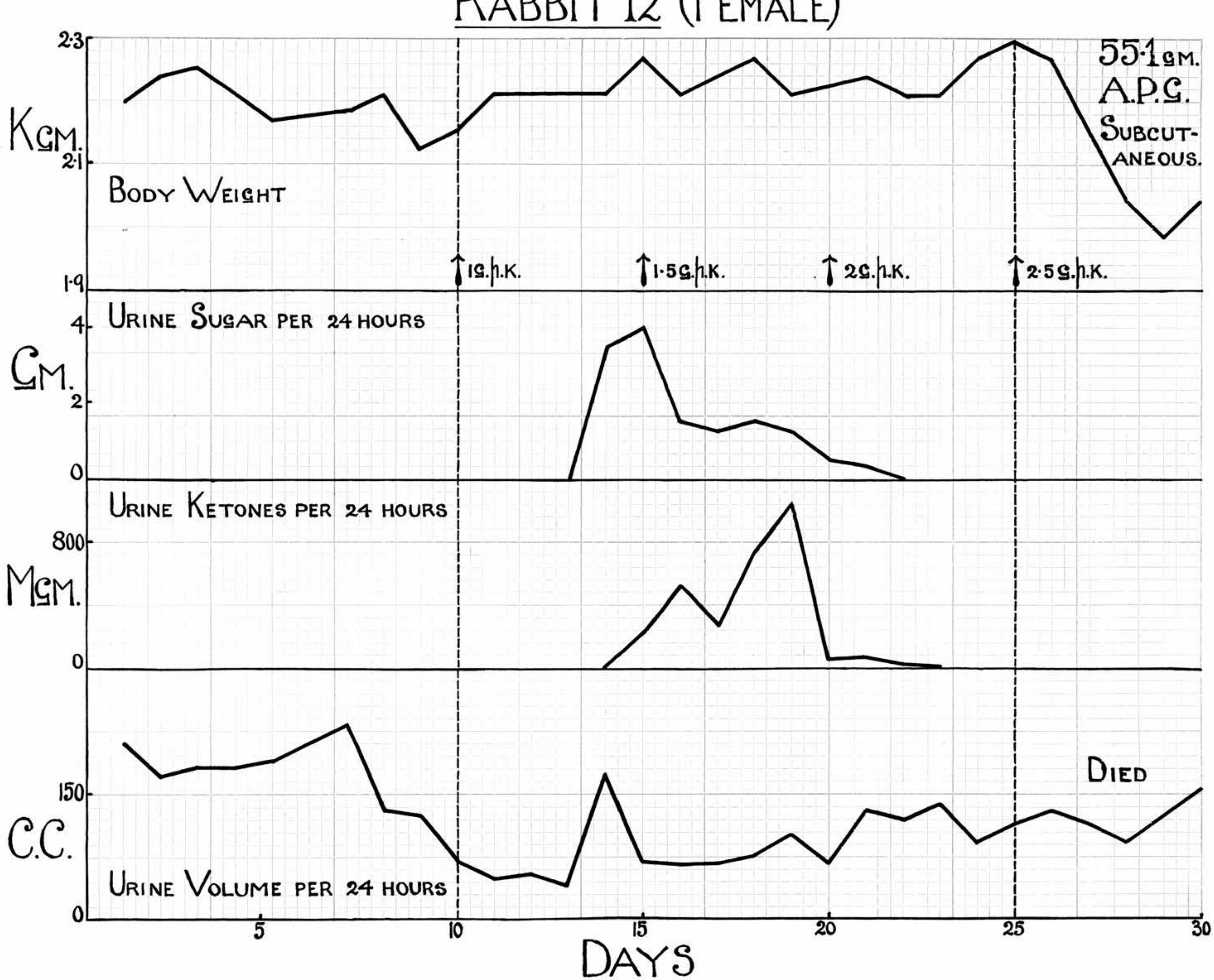

RABBIT 12 (FEMALE)
55·1 GM.
A.P.G.
SUBCUT-
ANEOUS.
KGM.
2·3
2·1
1·9
BODY WEIGHT
↑1G. h.K.
↑1·5G. h.K.
↑2G. h.K.
↑2·5G. h.K.
URINE SUGAR PER 24 HOURS
GM.
4
2
0
URINE KETONES PER 24 HOURS
MGM.
800
0
DIED
C.C.
150
0
URINE VOLUME PER 24 HOURS
5
10
15
20
25
30
DAYS

Figure 12.

Rabbit 13 (Male)

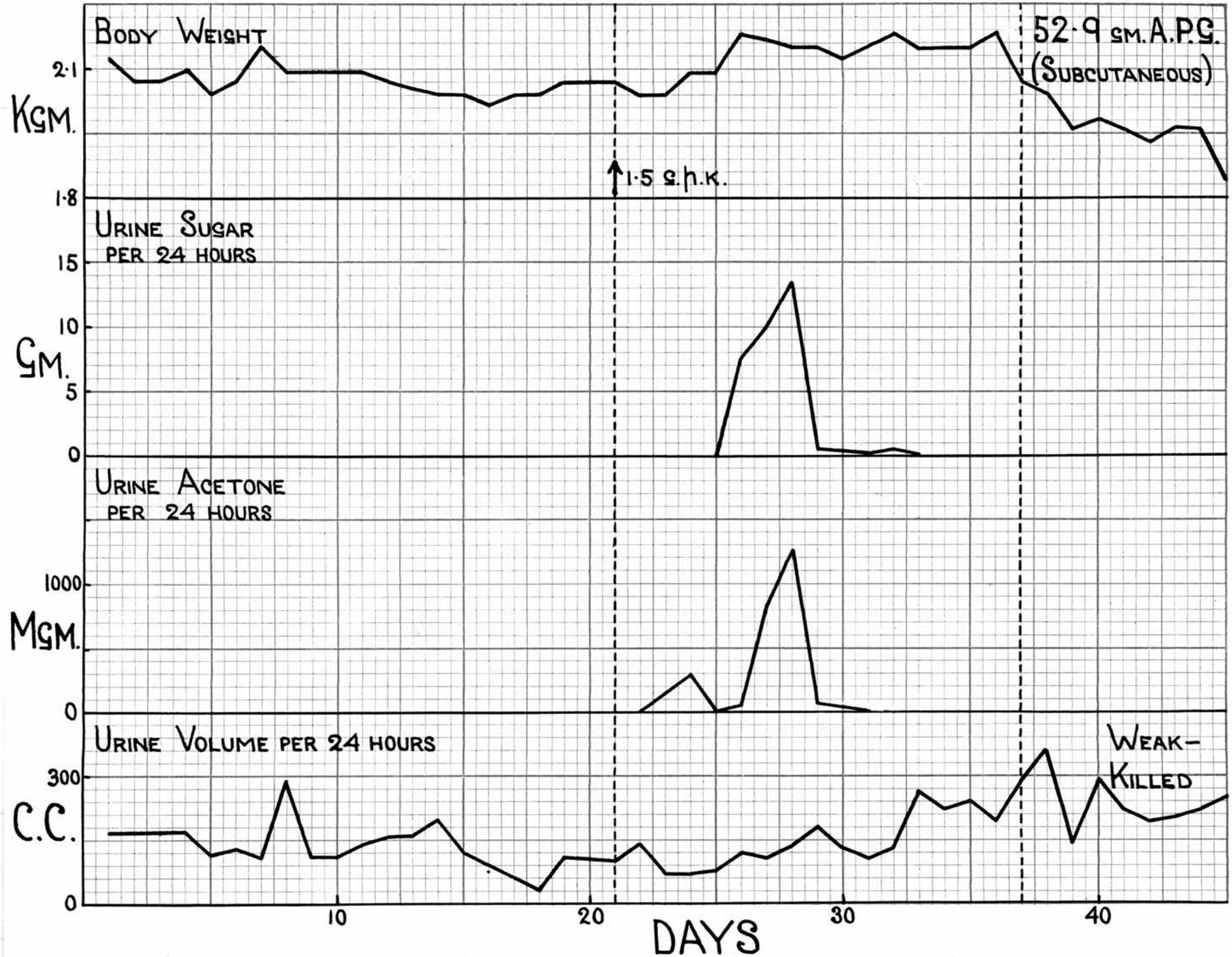


Figure 13.

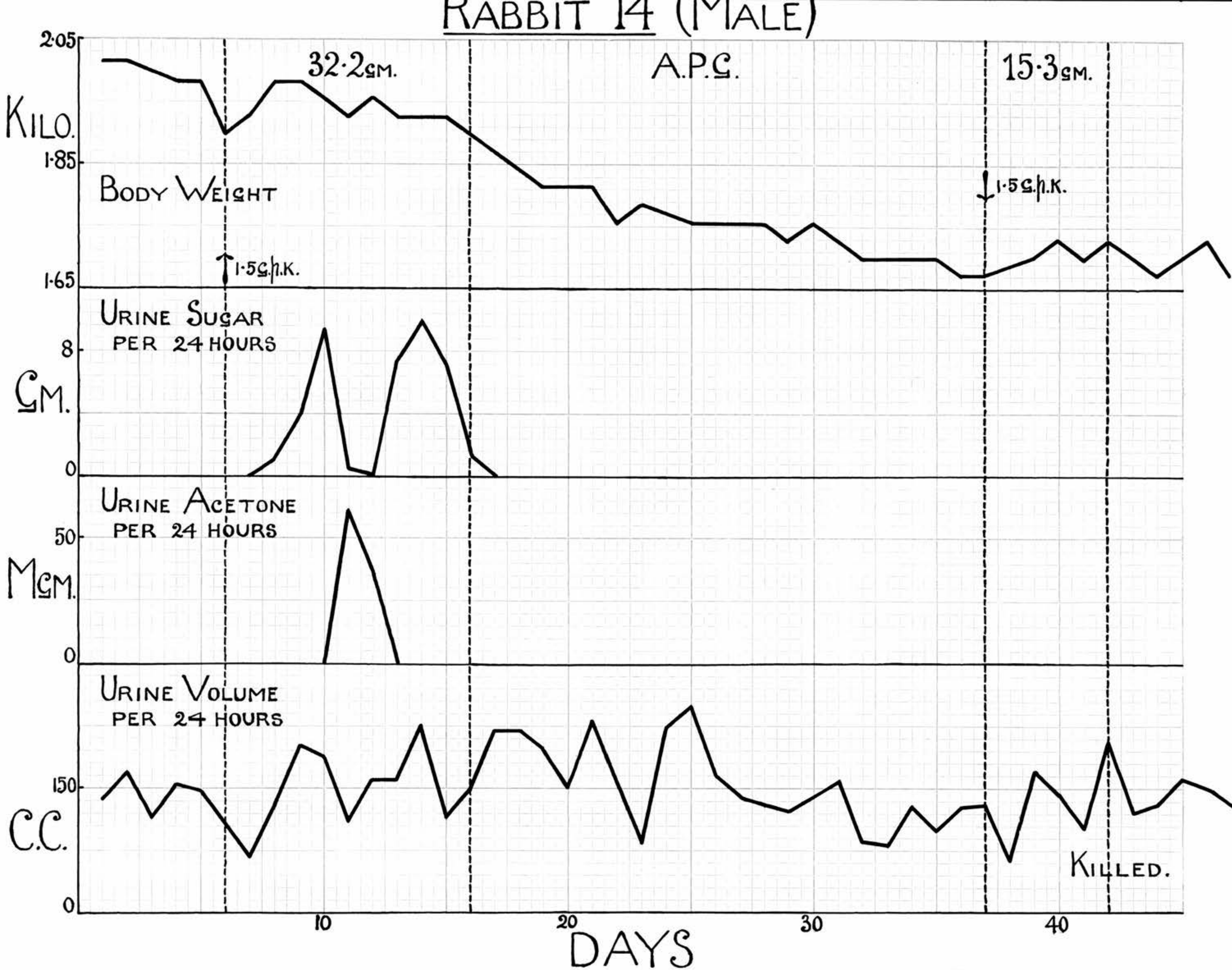
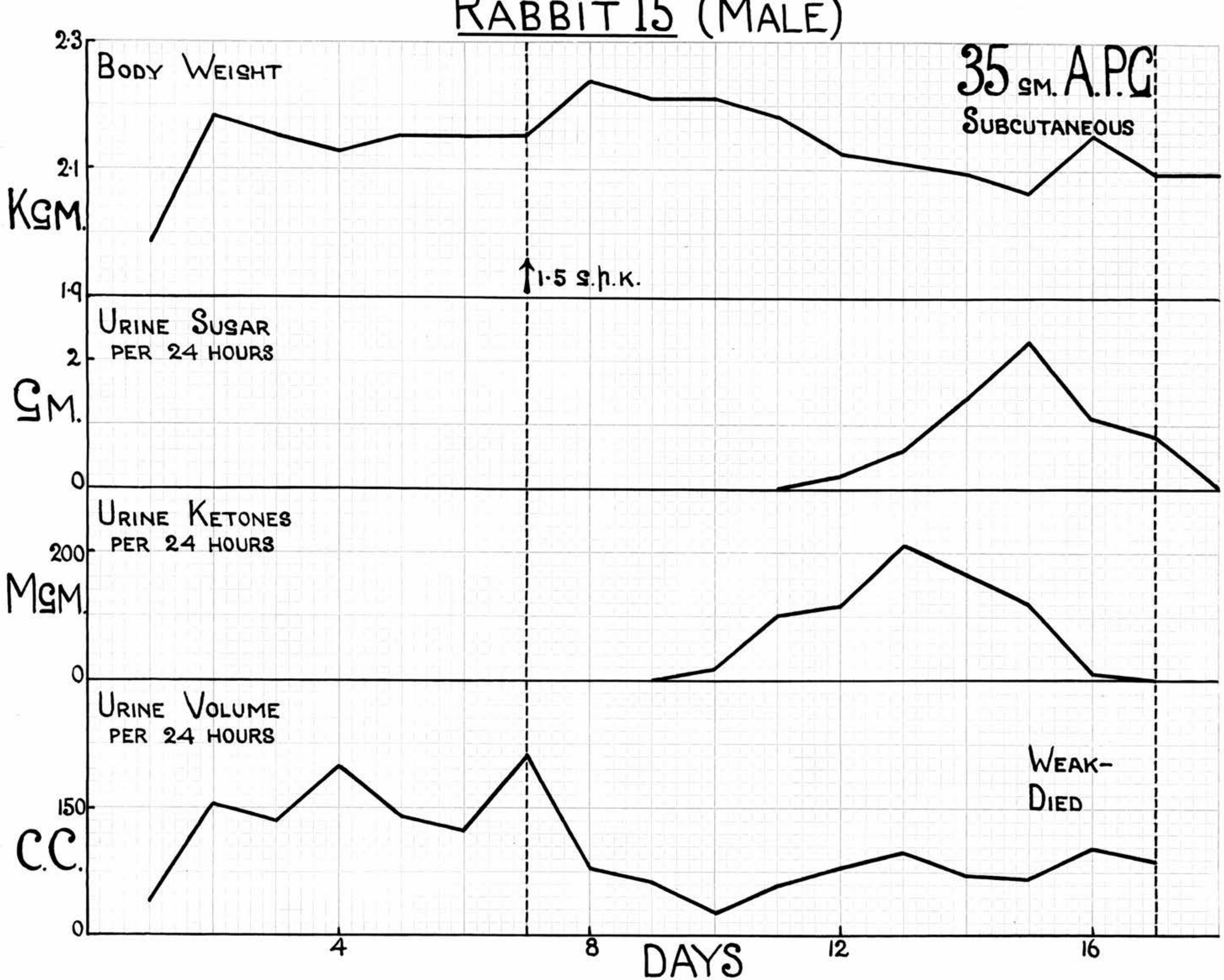

RABBIT 14 (MALE)
2·05
1·85
1·65
KILO.
32·2GM.
A.P.G.
15·3GM.
BODY WEIGHT
1·5G.p.K.
1·5G.p.K.
URINE SUGAR
PER 24 HOURS
8
0
GM.
URINE ACETONE
PER 24 HOURS
50
0
MGM.
URINE VOLUME
PER 24 HOURS
150
0
C.C.
KILLED.
10
20
30
40
DAYS

Figure 14.



RABBIT 15 (MALE)
BODY WEIGHT
35 GM. A.P.G
SUBCUTANEOUS
2·3
2·1
KGM.
1·9
1·5 G.h.K.
URINE SUGAR
PER 24 HOURS
2
GM.
0
URINE KETONES
PER 24 HOURS
200
MGM.
0
URINE VOLUME
PER 24 HOURS
WEAK-
DIED
150
C.C.
0
4
8
12
16
DAYS

Figure 15.

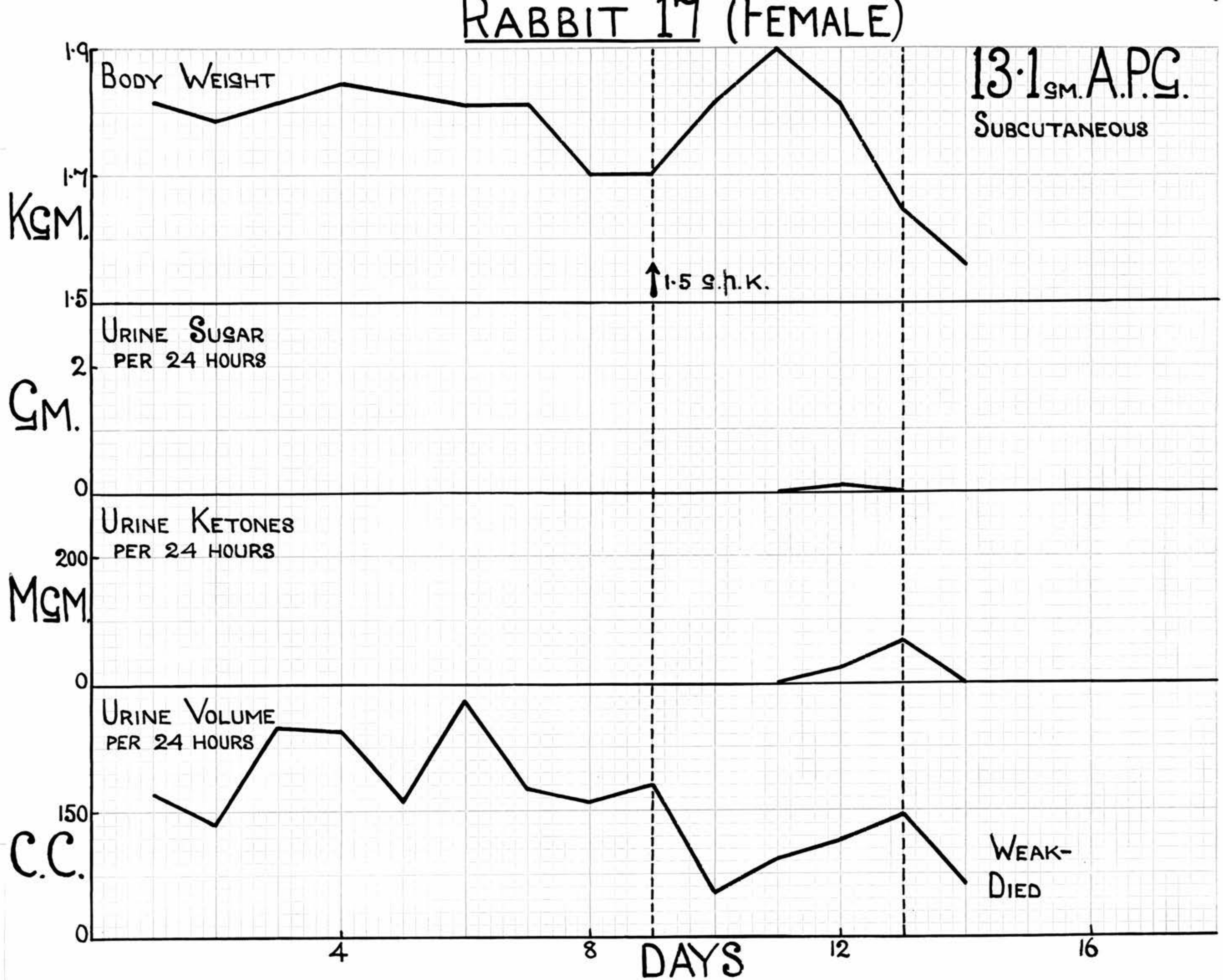

RABBIT 17 (FEMALE)
13·1 GM. A.P.G.
SUBCUTANEOUS
BODY WEIGHT
1·9
1·7
1·5
KGM.
↑1·5 G.h.K.
URINE SUGAR
PER 24 HOURS
2
0
GM.
URINE KETONES
PER 24 HOURS
200
0
MGM.
URINE VOLUME
PER 24 HOURS
150
0
C.C.
WEAK-
DIED
4
8
12
16
DAYS

Figure 16.

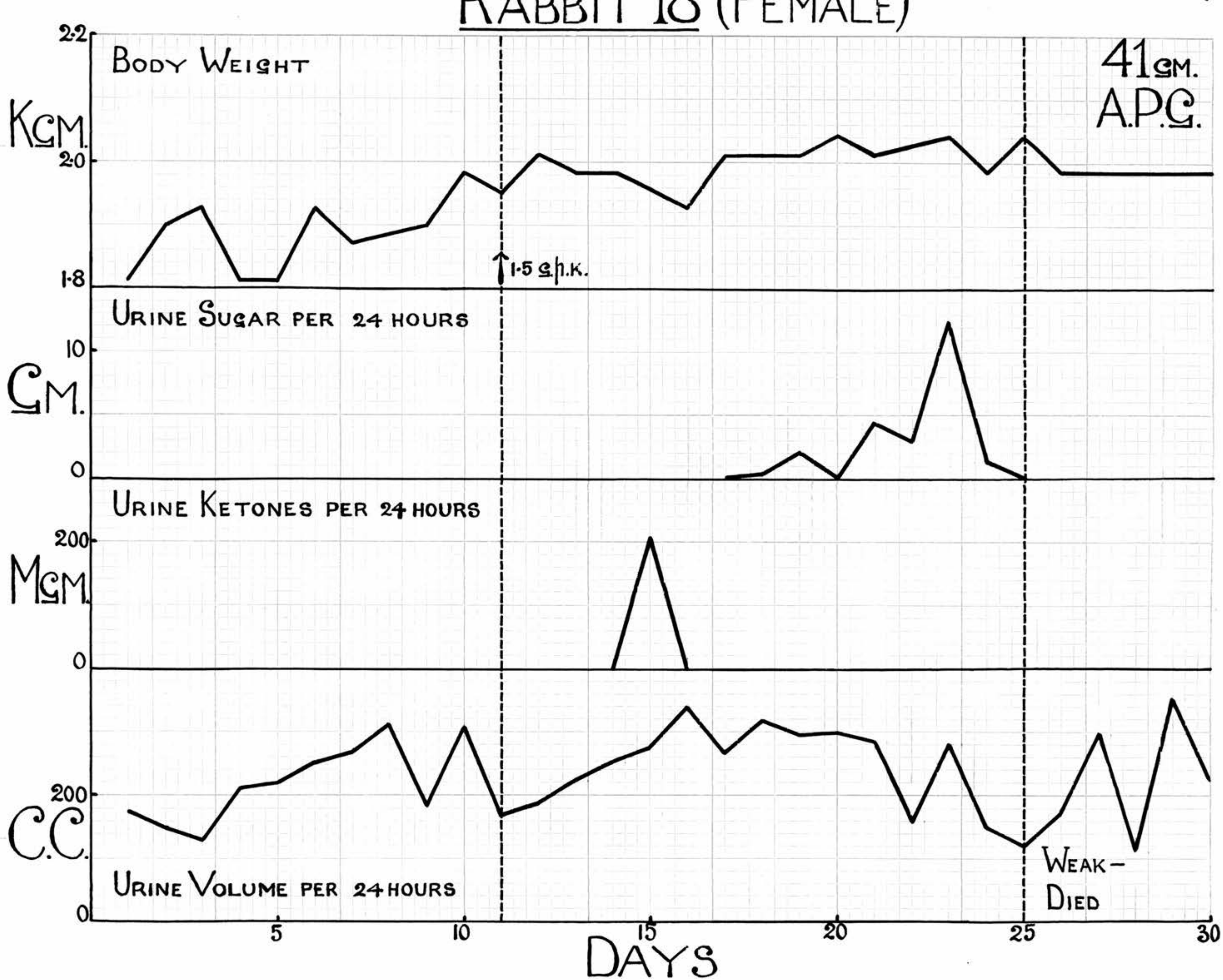
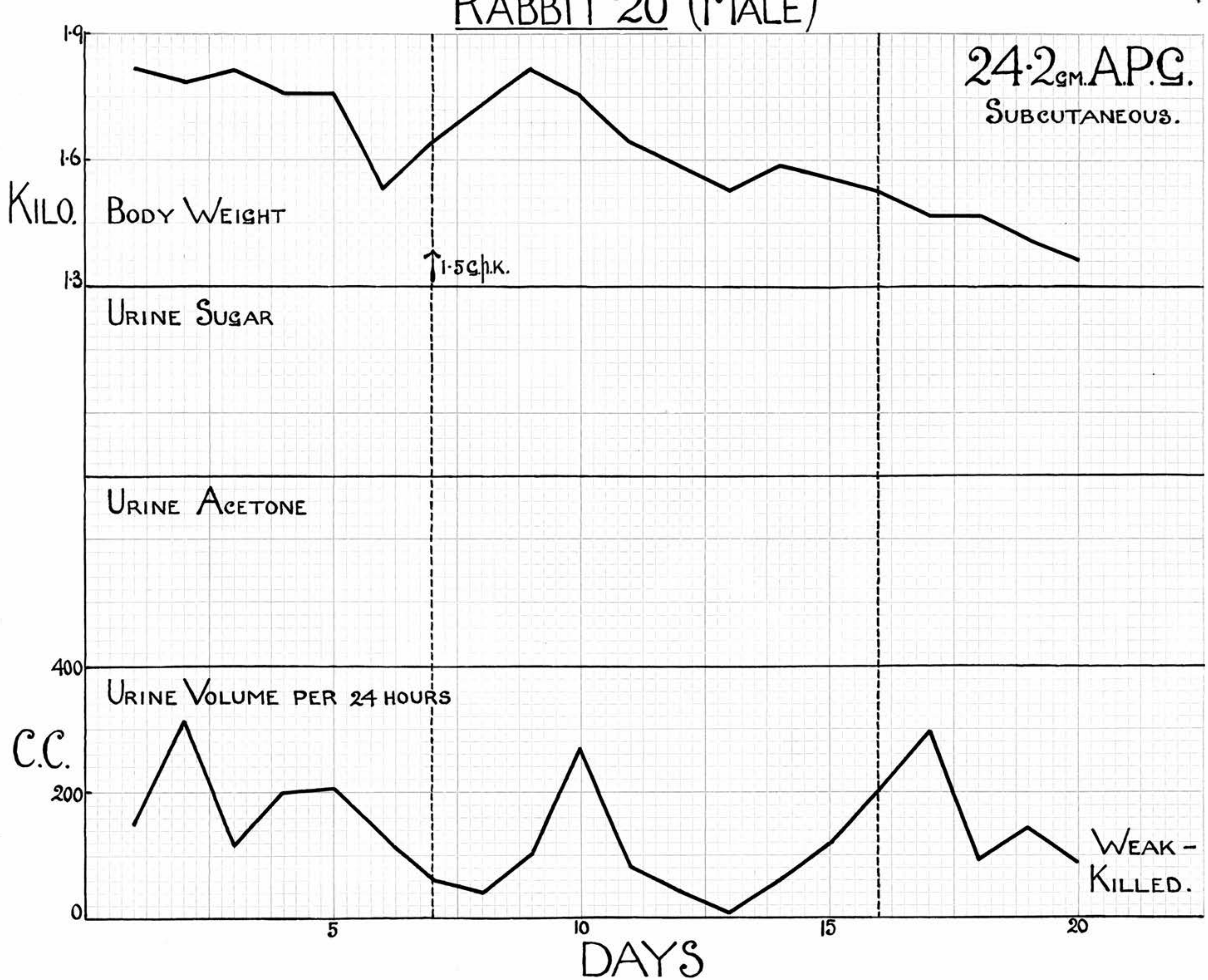

RABBIT 18 (FEMALE)
BODY WEIGHT
41 GM.
A.P.G.
KGM.
2·2
2·0
1·8
↑1·5 g.p.k.
URINE SUGAR PER 24 HOURS
GM.
10
0
URINE KETONES PER 24 HOURS
MGM.
200
0
C.C.
200
0
URINE VOLUME PER 24 HOURS
WEAK – DIED
5
10
15
20
25
30
DAYS

Figure 17.



RABBIT 20 (MALE)
24·2 GM. A.P.G.
SUBCUTANEOUS.
1·9
1·6
1·3
KILO.
BODY WEIGHT
1·5 G. p.K.
URINE SUGAR
URINE ACETONE
400
200
0
C.C.
URINE VOLUME PER 24 HOURS
WEAK –
KILLED.
5
10
15
20
DAYS

Figure 18.

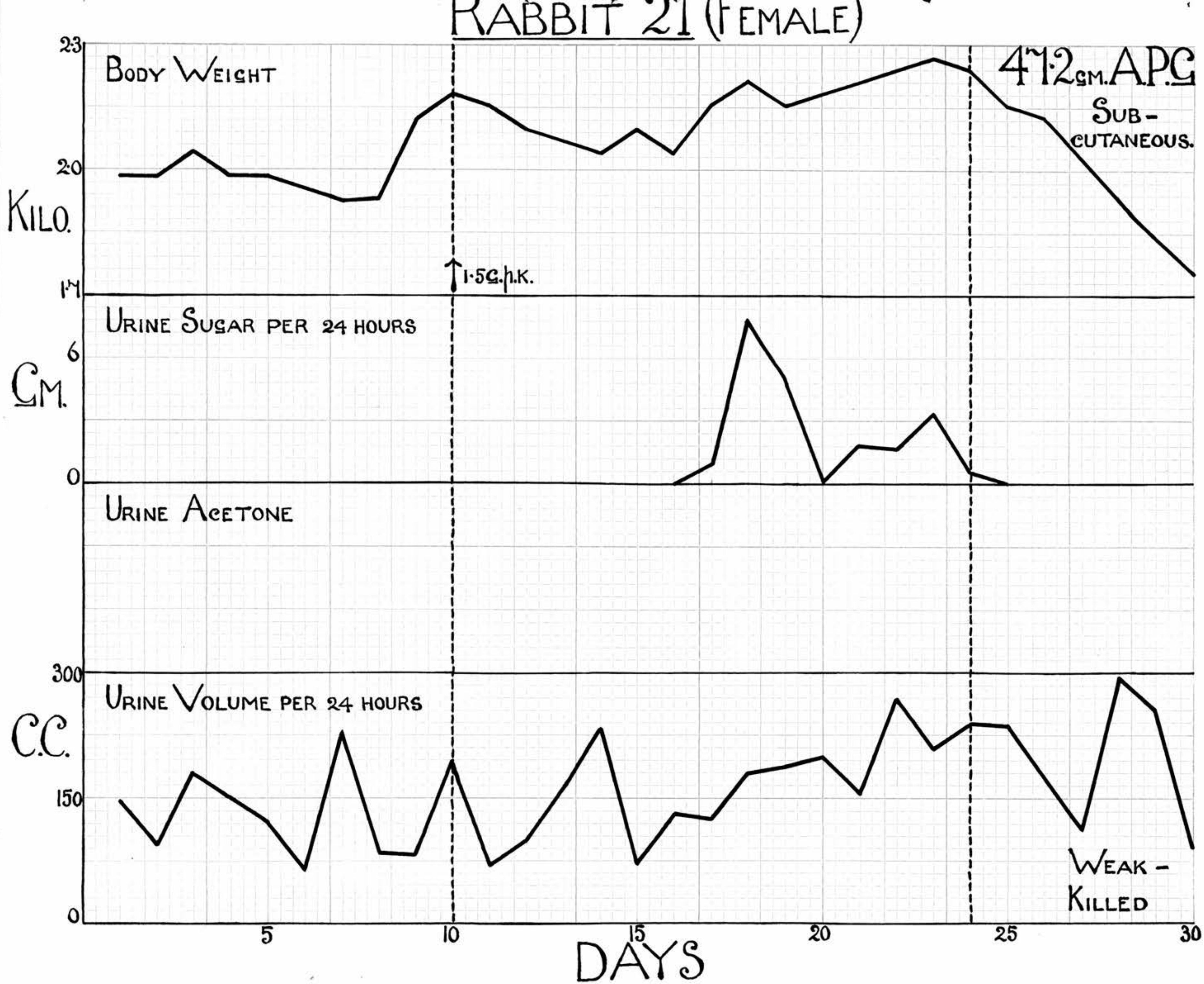

RABBIT 21 (FEMALE)
BODY WEIGHT
47·2 GM. A.P.G.
SUB-
CUTANEOUS.
KILO.
23
2·0
1·7
↑1·5 G. p.K.
URINE SUGAR PER 24 HOURS
GM.
6
0
URINE ACETONE
URINE VOLUME PER 24 HOURS
C.C.
300
150
0
WEAK -
KILLED
5
10
15
20
25
30
DAYS

Figure 19.

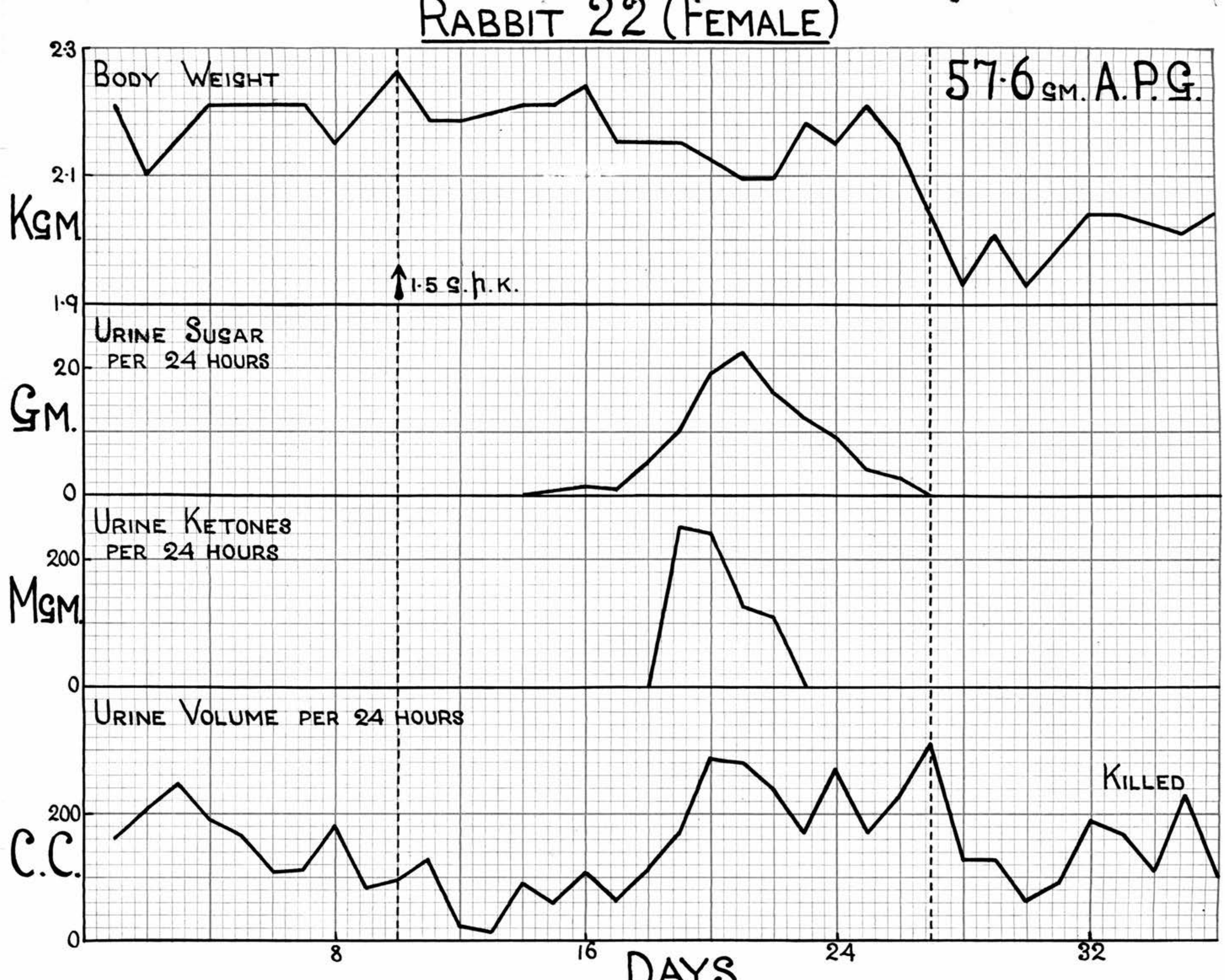
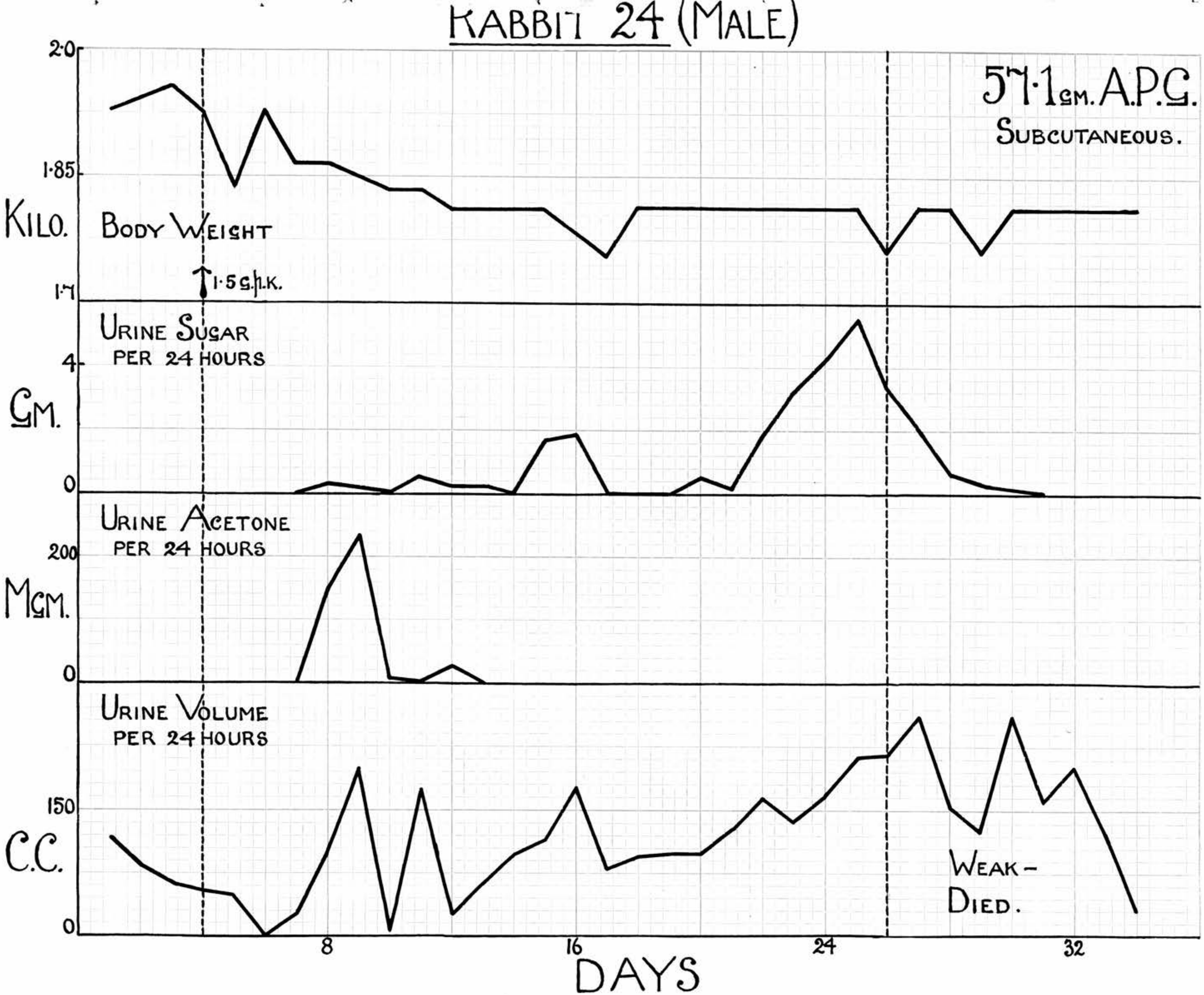
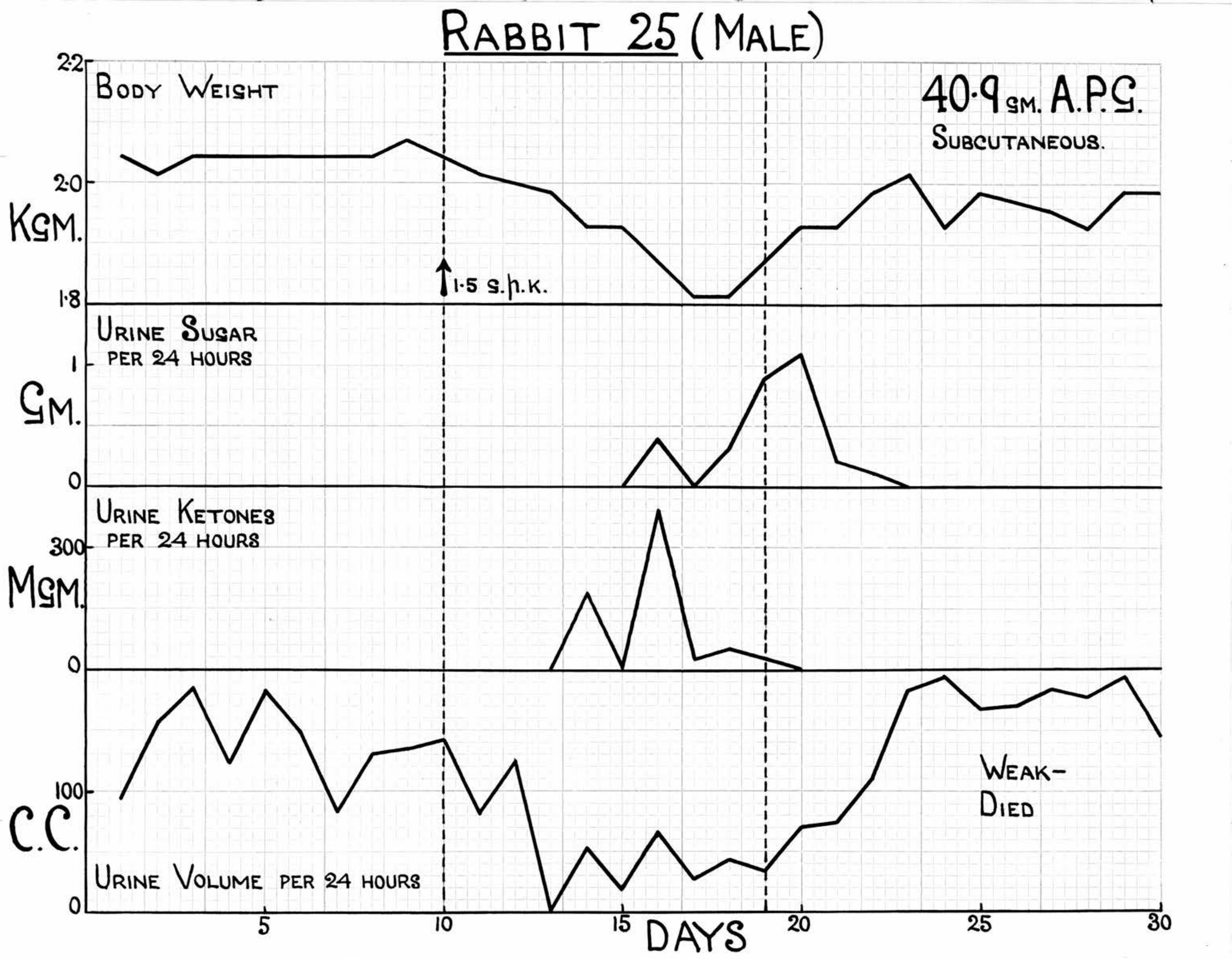

Rabbit 22 (Female)
Body Weight
57·6 gm. A.P.G.
2·3
2·1
1·9
Kgm
↑1·5 g. h.K.
Urine Sugar per 24 hours
20
0
Gm.
Urine Ketones per 24 hours
200
0
Mgm.
Urine Volume per 24 hours
Killed
200
0
C.C.
8
16
24
32
Days

Figure 20.



RABBIT 24 (MALE)
57·1 GM. A.P.G.
SUBCUTANEOUS.
2·0
1·85
KILO.
BODY WEIGHT
1·5 G.P.K.
1·7
URINE SUGAR
PER 24 HOURS
4
GM.
0
URINE ACETONE
PER 24 HOURS
200
MGM.
0
URINE VOLUME
PER 24 HOURS
150
C.C.
0
WEAK -
DIED.
8
16
24
32
DAYS

Figure 21.



Rabbit 25 (Male)
40·9 gm. A.P.G.
Subcutaneous.
Body Weight
1·5 g.p.k.
Kgm.
2·2
2·0
1·8
Urine Sugar
per 24 hours
Gm.
1
0
Urine Ketones
per 24 hours
Mgm.
300
0
Urine Volume per 24 hours
C.C.
100
0
Weak-
Died
5
10
15
20
25
30
Days

Figure 22.

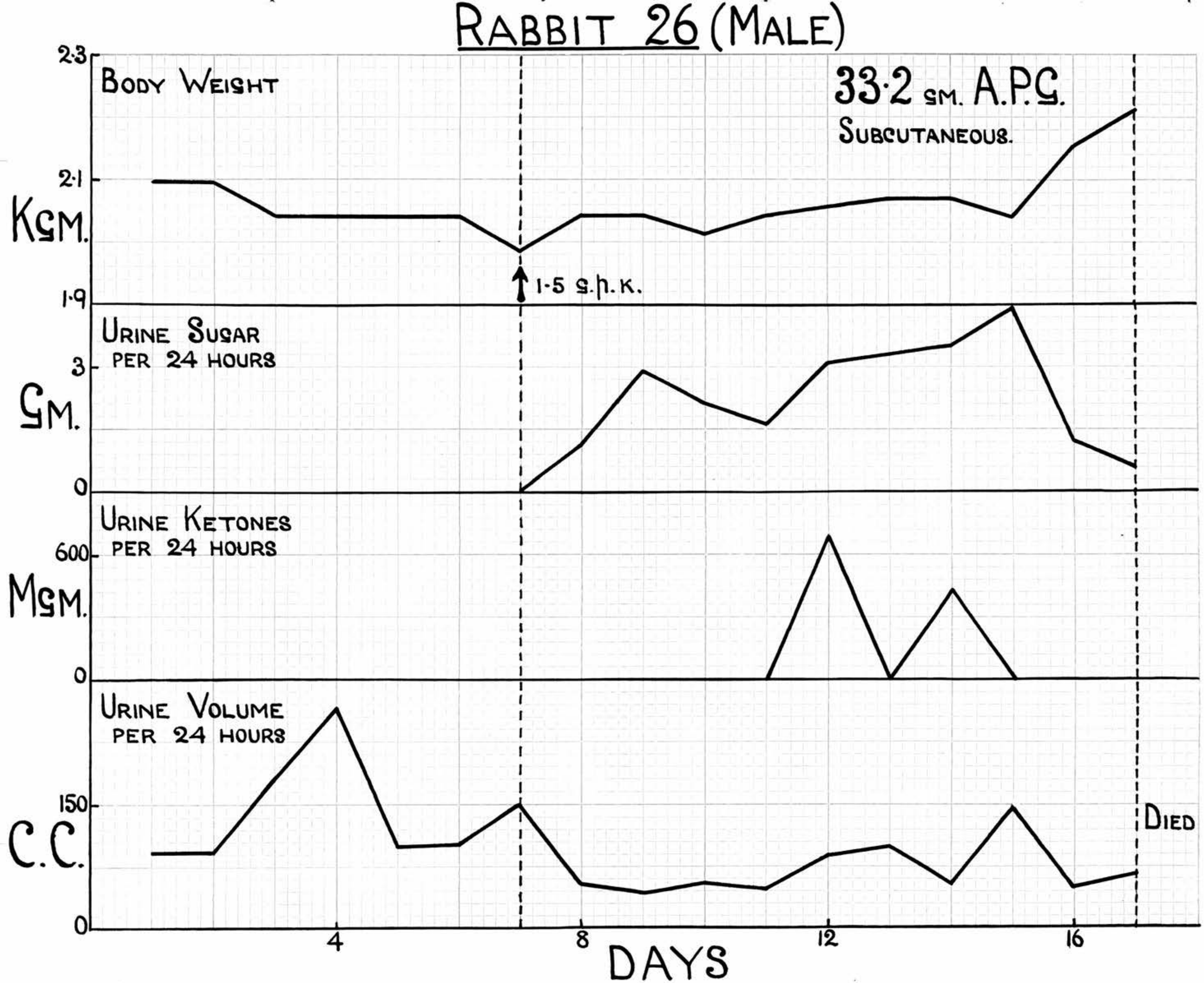

Rabbit 26 (Male)
33·2 gm. A.P.G.
Subcutaneous.
Body Weight
Kgm.
2·3
2·1
1·9
1·5 g.p.k.
Urine Sugar
per 24 hours
Gm.
3
0
Urine Ketones
per 24 hours
Mgm.
600
0
Urine Volume
per 24 hours
C.C.
150
0
Died
4
8
12
16
Days

Figure 23.

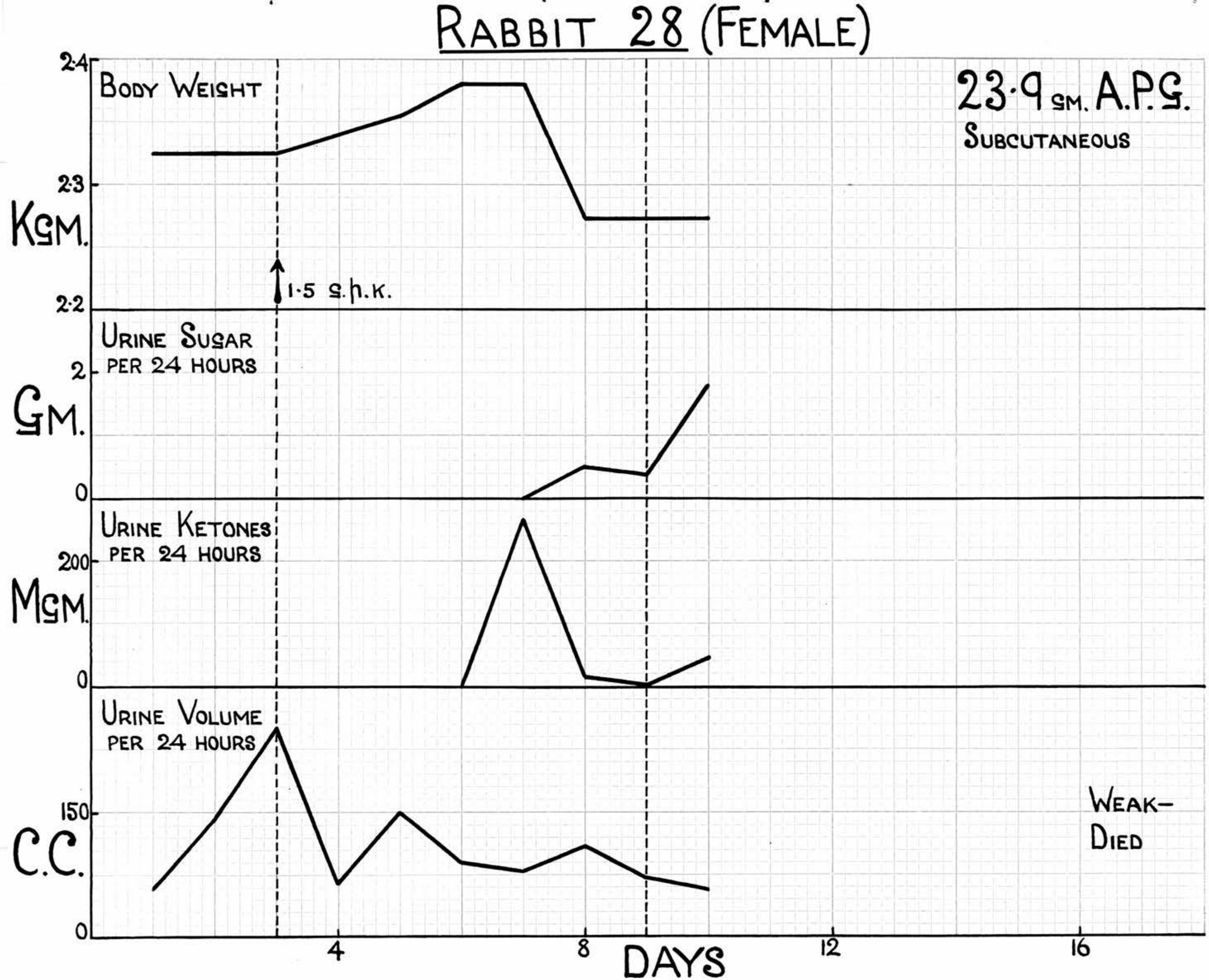

RABBIT 28 (FEMALE)
BODY WEIGHT
23·9 GM. A.P.G.
SUBCUTANEOUS
1·5 G.h.K.
URINE SUGAR
PER 24 HOURS
URINE KETONES
PER 24 HOURS
URINE VOLUME
PER 24 HOURS
WEAK–
DIED
2·4
2·3
2·2
KGM.
2
0
GM.
200
0
MGM.
150
0
C.C.
4
8
12
16
DAYS

Figure 24.

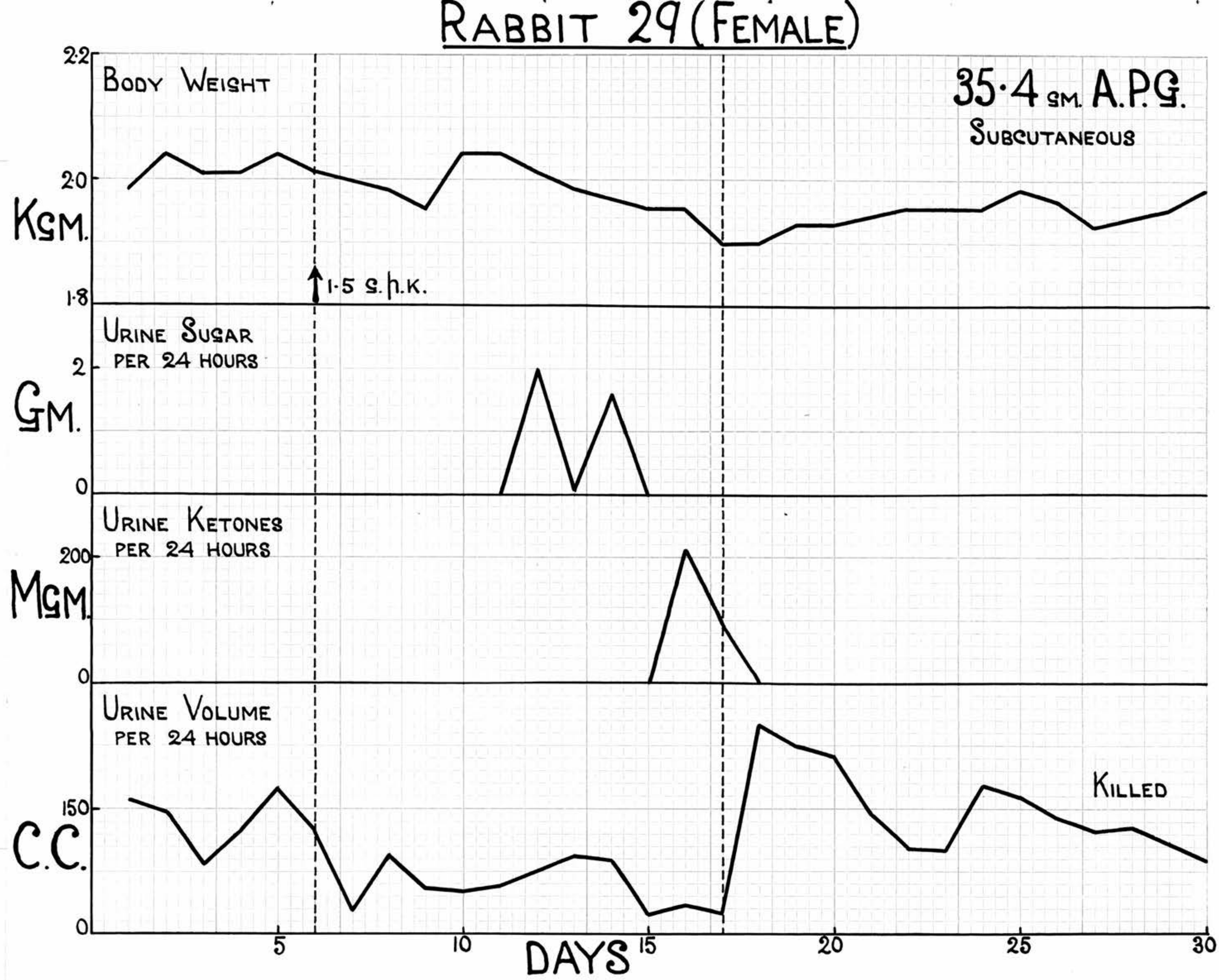
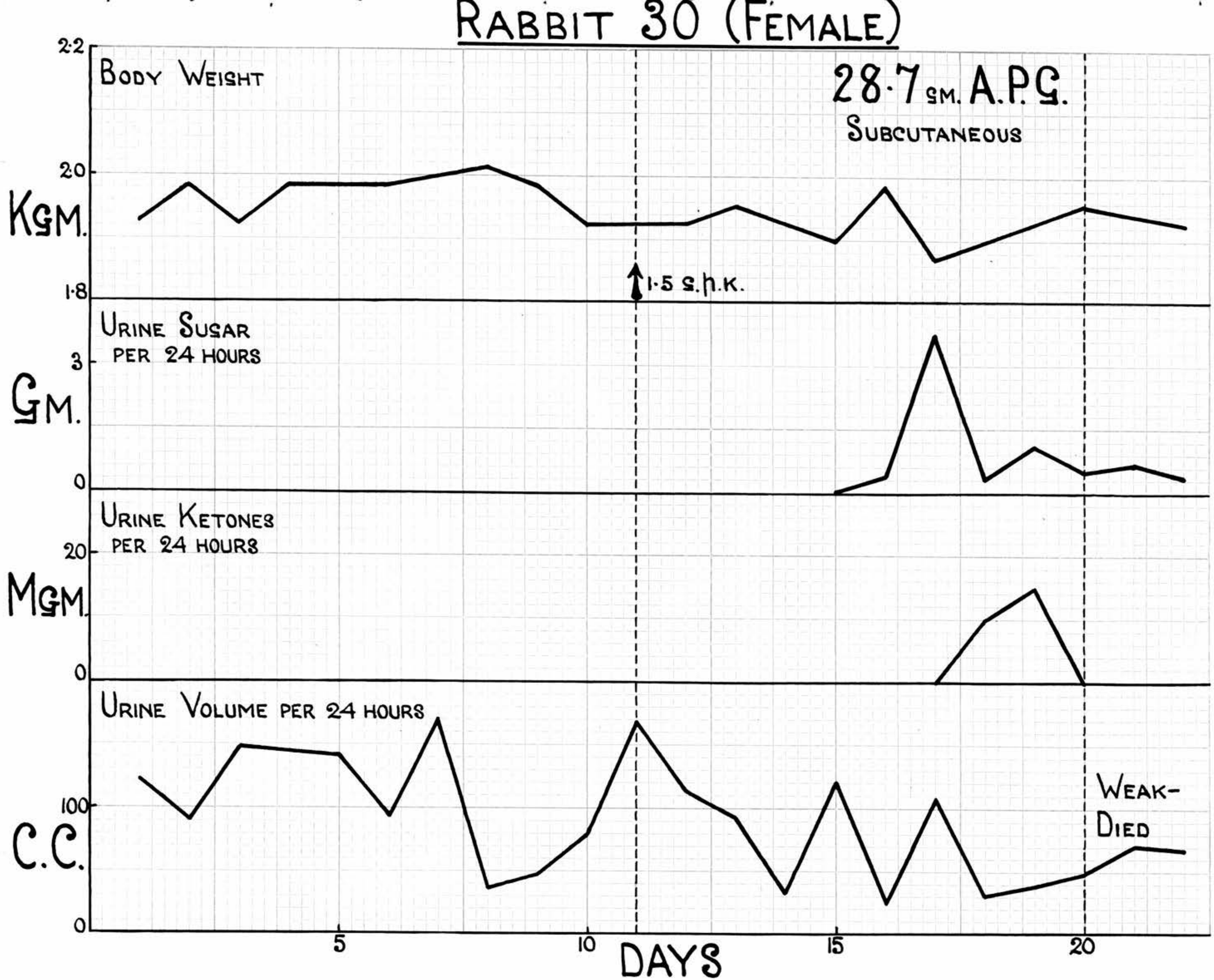
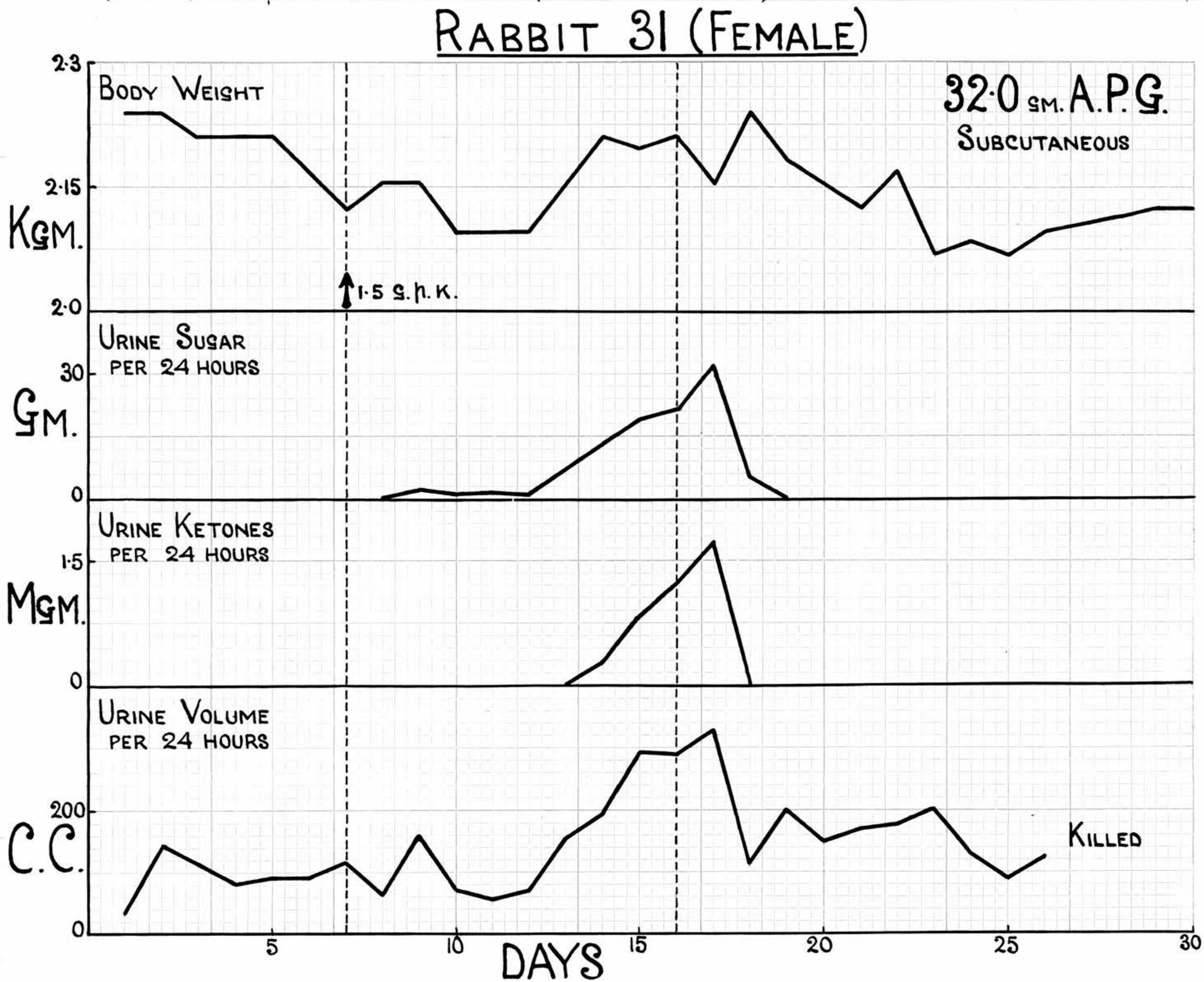

RABBIT 29 (FEMALE)
BODY WEIGHT
35·4 GM. A.P.G.
SUBCUTANEOUS
KGM.
2·2
2·0
1·8
1·5 G. h.K.
URINE SUGAR
PER 24 HOURS
GM.
2
0
URINE KETONES
PER 24 HOURS
MGM.
200
0
URINE VOLUME
PER 24 HOURS
KILLED
C.C.
150
0
5
10
15
20
25
30
DAYS

Figure 25.



RABBIT 30 (FEMALE)
BODY WEIGHT
28·7 GM. A.P.G.
SUBCUTANEOUS
1·5 G.h.K.
KGM.
2·2
2·0
1·8
URINE SUGAR
PER 24 HOURS
GM.
3
0
URINE KETONES
PER 24 HOURS
MGM.
20
0
URINE VOLUME PER 24 HOURS
WEAK-
DIED
C.C.
100
0
5
10
15
20
DAYS

Figure 26.



Rabbit 31 (Female)
32·0 gm. A.P.G.
Subcutaneous
Body Weight
Kgm.
2·3
2·15
2·0
1·5 g. p. K.
Urine Sugar per 24 hours
Gm.
30
0
Urine Ketones per 24 hours
Mgm.
1·5
0
Urine Volume per 24 hours
C.C.
200
0
Killed
5
10
15
20
25
30
Days

Figure 27.

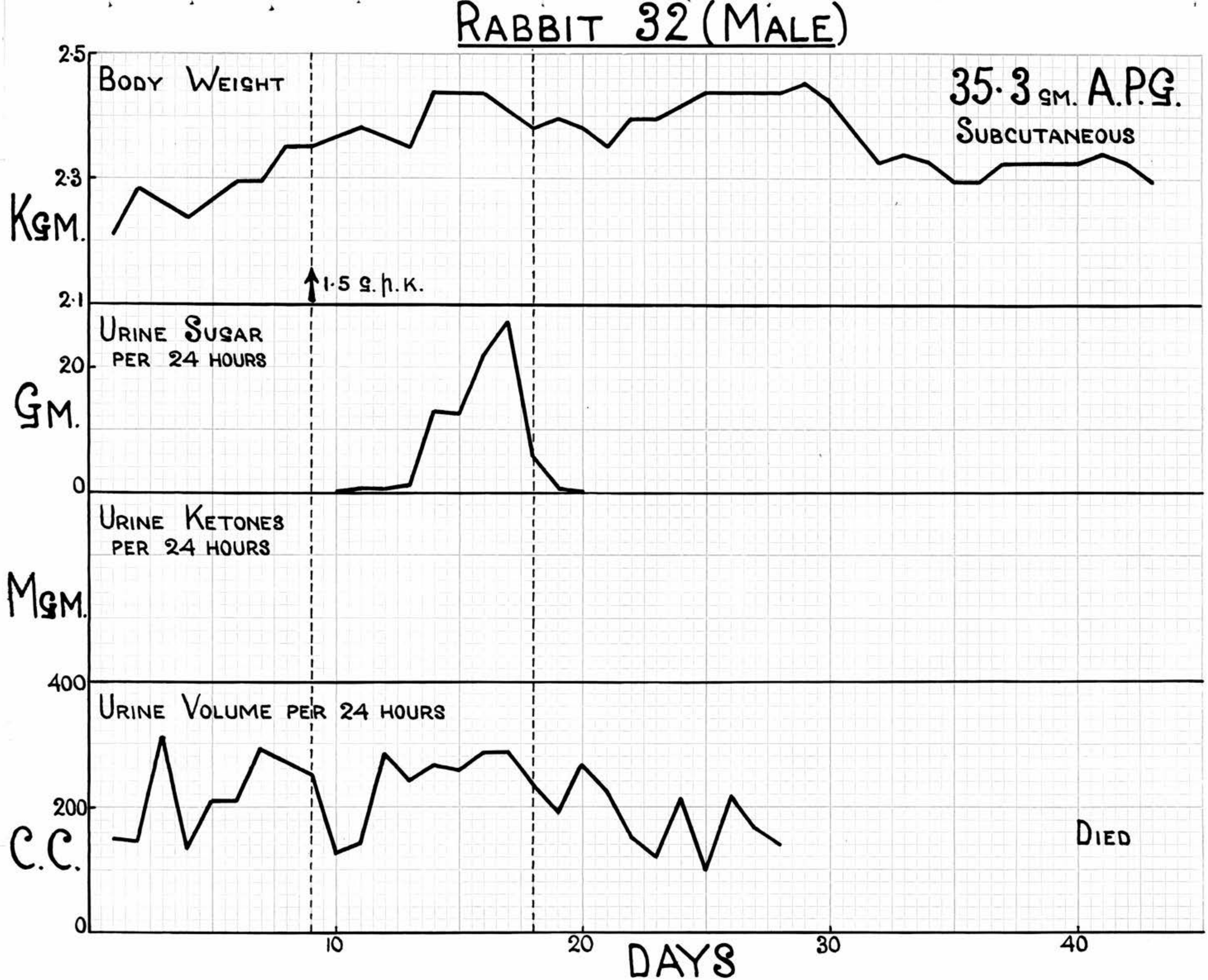
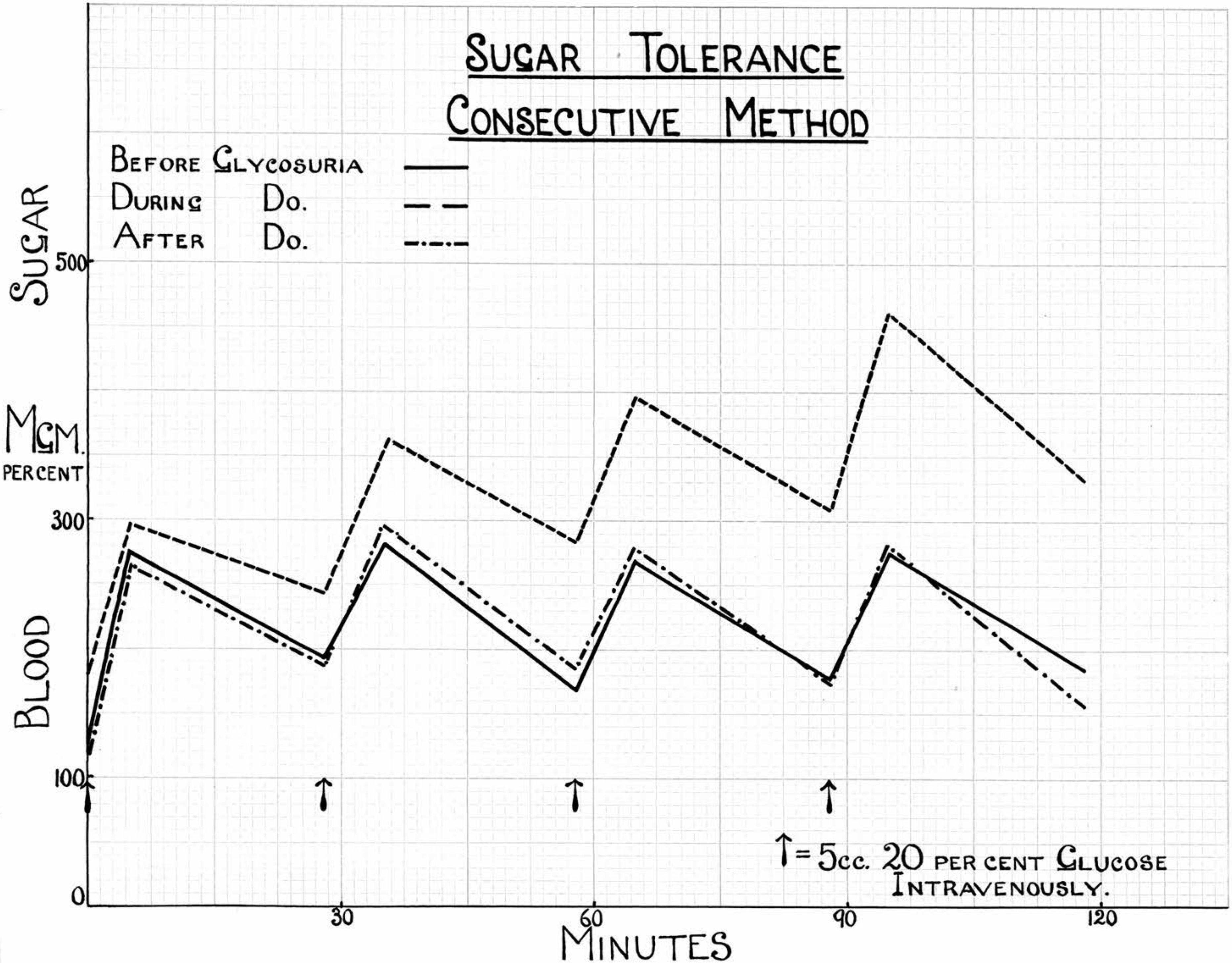

RABBIT 32 (MALE)
BODY WEIGHT
35·3 GM. A.P.G.
SUBCUTANEOUS
1·5 g. h. k.
URINE SUGAR
PER 24 HOURS
URINE KETONES
PER 24 HOURS
URINE VOLUME PER 24 HOURS
DIED
2·5
2·3
2·1
KGM.
20
0
GM.
MGM.
400
200
0
C.C.
10
20
30
40
DAYS

Figure 28.



Sugar Tolerance
Consecutive Method
Before Glycosuria
During Do.
After Do.
Blood Sugar Mgm. percent
500
300
100
0
30
60
90
120
Minutes
↑ = 5cc. 20 per cent Glucose Intravenously.

Figure 30.

circulation in a slightly more adequate manner than its predecessor. This effect which is known as the Staub-Traugott phenomenon was first described by Hamman and Hirschman (1919) and is regarded by Himsworth (1934) as one of the most delicate reactions in carbohydrate metabolism. The curve of tolerance <u>during</u> the diabetic phase is based on the average of Rabbits 10 and 11 and has on the average a distinctly upward direction. The explanation of such a curve is found principally in the fact that the blood sugar after each injection fails to fall to the same degree as it does in the course of the normal tolerance test. Thus, whereas in the normal tolerance curve the blood sugar after the first three injections falls 82, 111 and 91 mg. per cent respectively, reductions of 54, 80 and 87 mg. per cent respectively occur in the curve of sugar tolerance during the diabetic phase. The reverse degree of fall after the fourth injection is undoubtedly due to experimental error. A curve of such rising character, indeed, is in keeping with the results of the single method, since this method revealed that the blood sugar between 20 and 30 minutes fell at only half the control rate and must, therefore, be abnormally elevated at 28 minutes when a second intravenous injection of glucose is given in the consecutive method. The consecutive method thus yields a graph which is merely a reduplicated version of/

of that obtained by the single method and which similarly indicates that the diabetic phase is accompanied by a definitely lowered sugar tolerance.

Sugar tolerance was estimated in Rabbits 7 and 9 one and two days respectively <u>after</u> the cessation of glycosuria and also thereafter in Rabbits 10 and 11 at intervals of twenty-two and twenty-three days respectively. The graph yielded by Rabbit 7 is definitely rising in character, while that of Rabbit 9 shows a moderate rise. Both graphs indicate that the sugar tolerance of these animals is still abnormally low. The graph constructed from the average of Rabbits 10 and 11, on the other hand, practically duplicates that of normal tolerance and, like it, shows on the average that slightly downward trend indicative of an increasing adequacy to deal with sugar. These findings justify the conclusion that sugar tolerance remains depressed for a short time even after the cessation of glycosuria, but that at about three weeks thereafter tolerance for sugar has returned to within definitely normal limits. Finally, the sugar tolerance of Rabbit 12 was investigated by means of a 100 per cent glucose solution instead of the usual 5 per cent solution. Allowing for experimental errors in the control experiment the graph gauging sugar tolerance 24 days after the diabetic phase was again similar to that of normal tolerance.

(5) <u>Insulin Sensitivity</u>. Six rabbits were investigated/

investigated from the point of view of insulin sensitivity by the method defined above. Each was tested in the control stage and during the diabetic phase, while three were also assessed after the glycosuric period. The results are set out in Table IV and collectively illustrated by Fig. 31. The curve of <u>normal</u> insulin sensitivity based on the average of the six animals begins at a fasting level of 132 mg. per cent and falls, after a short initial delay, rapidly and uniformly to 85 mg. per cent at 20 minutes. The blood sugar subsequently declines progressively more slowly and reaches 74 mg. per cent by 30 minutes. The curve then rises slowly and steadily to 80 mg. at 50 minutes. The blood sugar falls an absolute average of 58 mg. per cent (44 per cent) in 30 minutes, while the extremes are 41 mg. per cent in Rabbit 22 and 87 mg. per cent for Rabbit 18. Based on the average of the six animals the curve of insulin sensitivity <u>during</u> the diabetic phase starts at a fasting level of 172 mg. per cent which is 40 mg. per cent higher than the average control blood sugar. It shows no response for almost 10 minutes and then falls slowly to 154 mg. per cent after 25 minutes. The curve remains about the same level for 10 minutes and then rises at a slow steady rate to 164 mg. per cent at the end of 50 minutes. The average absolute fall is 18 mg. per cent (10 per cent) in 25 minutes, the extremes being an actual rise of 25 mg. per cent in Rabbit 13 and a fall of 47 mg./

TABLE IV

INSULIN SENSITIVITY

bbit	Stage	BLOOD SUGAR in mg. per cent								
		Fasting	5min	10min	15min	20min	25min	30min	40min	50min
3	Control	115	100	80	74	64	-	69 †	78 †	78 †
	Diabetes 1	131	142*	145†	149 *	156 *	-	151 †	149**	147
	2	117	112*	126*	112	117 *	117	117 *	109 *	-
	Recovery	-	-	-	-	-	-	-	-	-
4	Control	145	145*	135	122 *	103	83**	74	65	73
	Diabetes	165	168 *	156	158	158	154	161	159 †	156
	Recovery	87	82†	82	67 *	53	51	46	40	37
5	Control	151	145*	128	101 *	96	98	101	109	115
	Diabetes 1	183	183*	183	183	171	165	172	194	194
	2	187	178†	174	176	183	185	190 †	183**	189
	Recovery	-	-	-	-	-	-	-	-	-
8	Control	133	136	110†	101	85	73	58	46	47 ††
	Diabetes	245	237*	230	233	226	224	212	212	212
	Recovery	-	-	-	-	-	-	-	-	-
1	Control	127	119*	108*	94	81	69	63	69	75
	Diabetes	154	147*	136*	122	121	115*	110	115	119
	Recovery	112	109*	103	96	83	74	67	56	51
2	Control	119	115*	109	98 *	83 †	80	78	89	92
	*** Diabetes 1	160	165*	160	151	142	136	135	133	138
	2	163	180*	171	163 *	160	142*	140 *	133	149
	3	162	162*	156	147**	145*	140	147	160	178
	Recovery	138	105†	100	94*	74*	69	62	71	78*
rages	Control	132	127	112	98	85	81	74	76	80
	Diabetes	172	172	167	163	161	154	157	158	164
	Recovery	112	99	95	86	70	65	58	56	55

* + 1 minute

† + 2 minutes

** + 3 minutes

†† + 4 minutes.

*** Sugar excretion during day of test = (1) 5.3 g.; (2) 15.8 g. ; and (3) 4.1 g.

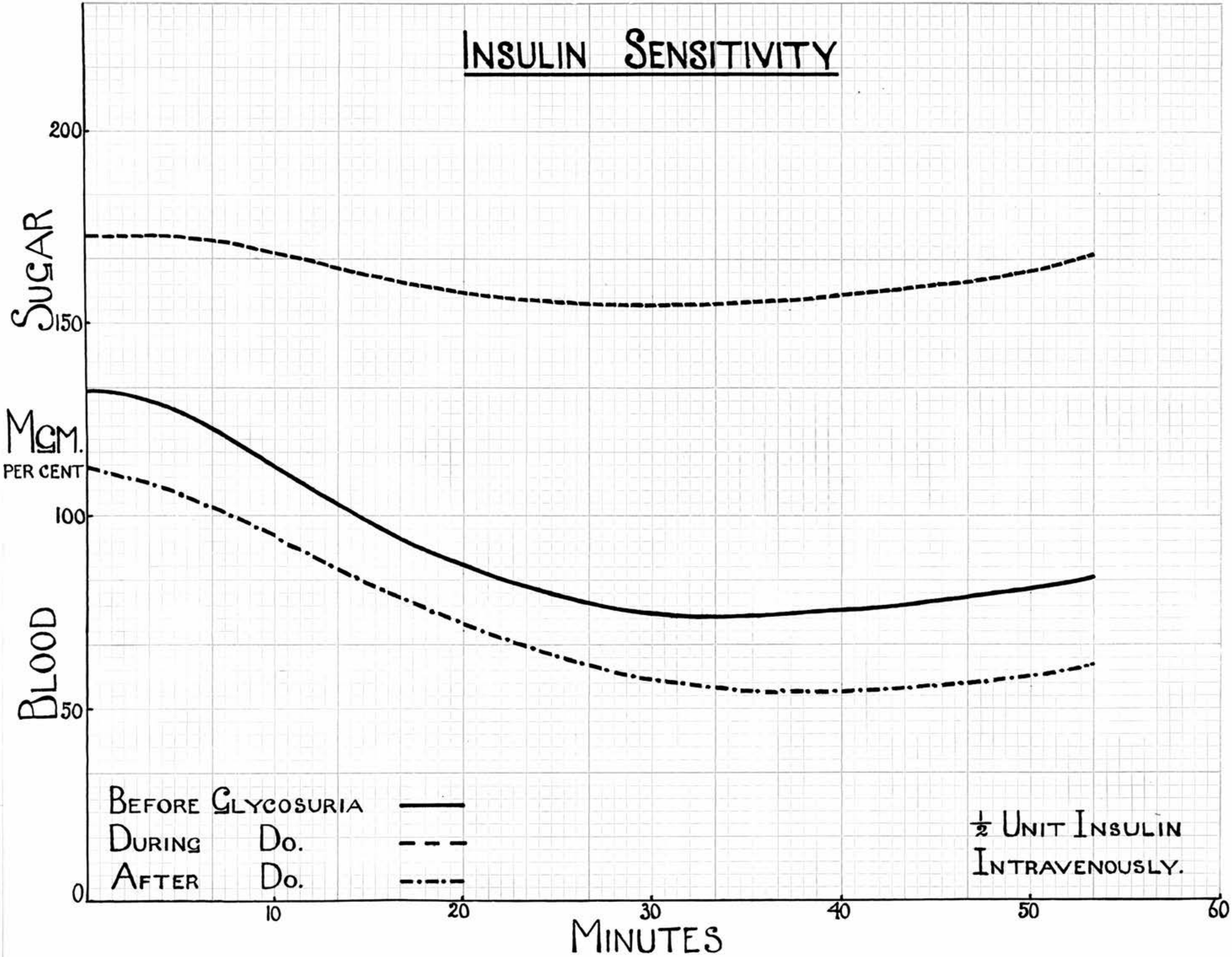

INSULIN SENSITIVITY
BLOOD SUGAR
MGM. PER CENT
200
150
100
50
0
MINUTES
10
20
30
40
50
60
BEFORE GLYCOSURIA
DURING DO.
AFTER DO.
½ UNIT INSULIN INTRAVENOUSLY.

Figure 31.

47 mg. per cent in Rabbit 22. Rabbit 22 is further instructive in that its blood sugar falls 22, 27 and 47 mg. per cent relative to a sugar excretion of 4.1 g., 5.3 g. and 15.8 g. per 24 hr. The significance of these reactions will be considered later, but the conclusion can now be made that since the percentage fall in response to insulin normally and during the diabetic phase is 44 per cent and 10 per cent respectively, insulin is at least four times <u>less</u> efficient in lowering the blood sugar in the diabetic as compared with the intact animal. The curve of insulin sensitivity <u>after</u> the diabetic phase is based on the average of Rabbits 14, 21 and 22 which were tested 18, 5 and 4 days respectively after the cessation of glycosuria and 18, 5 and 3 days respectively after the last injection. It begins at a fasting blood sugar of 112 mg. per cent and falls uniformly and fairly rapidly to 58 mg. per cent in half an hour. It declines thereafter in a scarcely perceptible manner until it reaches 55 mg. per cent at the end of the test. This curve differs from that of normal insulin sensitivity in that it is placed at a slightly lower level and fails to show any terminal recovery, but resembles it both in general form and in its fall of 57 mg. per cent (51 per cent) which is close to the normal response of 58 mg. per cent (44 per cent). The lower level of the curve is probably due to the fact that the animals have become accustomed to manipulative measures, while the curve of/

of one of them shows a definite terminal recovery. Insulin tolerance after the diabetic phase can, therefore, be regarded as having returned to within normal range.

(6) Urine Volume. Excluding two which developed diarrhoea, twenty-one of the twenty-eight rabbits reacted to the initial injections of extract by excreting less urine. The degree of oliguria varied. Thus, three rabbits continued to pass more than 100 c.c. urine per 24 hr., while seven excreted between 40 and 65 c.c., eight between 20 and 40 c.c. and three less than 20 c.c. per 24 hr. Two of the last group of three were the most extreme examples in that each passed no urine for a period of 24 hr. The initial fall in urine volume was followed by a variety of reactions. Three animals continued to excrete a progressively less amount of urine, while the output of another three remained on the average at the level to which it had fallen. Fifteen rabbits increased their urine volume. The improvement usually began immediately after the initial fall, but was sometimes delayed for a period of days. In spite of it, three animals continued to excrete a subnormal amount of urine. Three, however, returned to normal excretion levels by the end of treatment and at this point nine rabbits even passed more copious urine than they ever did under control. Three of the remainder showed no significant change in urinary output during treatment, while the excretion/

excretion of another was normal at first and later excessive. Finally, several animals which remained oliguric during extract treatment immediately became polyuric on the cessation of injections. Polyuria, however, was in no case marked.

(7) Food Consumption. Nineteen of the twenty-eight rabbits were investigated from the point of view of food consumption. Only one continued during treatment to eat the same amount of food as it did while being controlled. On the other hand, seventeen reacted immediately to extract therapy by eating less cabbage or bran or both. Two rabbits continued to have a constantly or increasingly poor appetite during the rest of their treatment. The remaining sixteen animals, however, after a variable period of days showed an improvement of appetite usually first in the direction of cabbage and then bran. Six rabbits despite such improvement still ate a subnormal diet by the end of treatment. Five recovered their usual appetite and five even entered on a phase of excessive food consumption. A normal or excessive appetite was sometimes acquired as early as the middle of treatment, but was in other cases delayed until just after the cessation of injections.

(8) Islet Tissue. (a) Histological Examination. A comparison of the pancreases of the injected rabbits with those of normal animals revealed two changes referable to the islet tissue. First, the average size of the islets in a proportion of the injected animals/

animals was distinctly greater than the average of the largest islets in the control series and the deduction, therefore, was drawn that the average size of the islets in the entire injected series was probably greater than the average of the islets in the whole control group. The enlarged islets were structurally normal and consisted of the usual proportion of A- and B-cells. They thus showed no degranulation, hydrops or hyalinisation, the production of which formed one of the aims of the research. They were also devoid of mitotic figures despite the fact that their enlarged condition was obviously the result of division and increase of their component cells. Secondly, the islets so far as could be gauged by mere visual examination of sections were normal in number throughout the entire injected series with the exception of Rabbit 2. An observation supporting the normality of the islets as regards number was the fact that the small ducts in the pancreases of all the injected animals except Rabbit 2 were normal in number and distribution and in the character of their lining epithelium.

Rabbit 2 differed from all the others of the injected group in that the pancreas showed the following changes. Whereas they occur singly or in pairs normally, the small pancreatic ducts in Rabbit 2 were found in conspicuous groups, frequently of about half-a-dozen (Figs. 32 and 33). The exact number of ducts in any group, however, was difficult to/

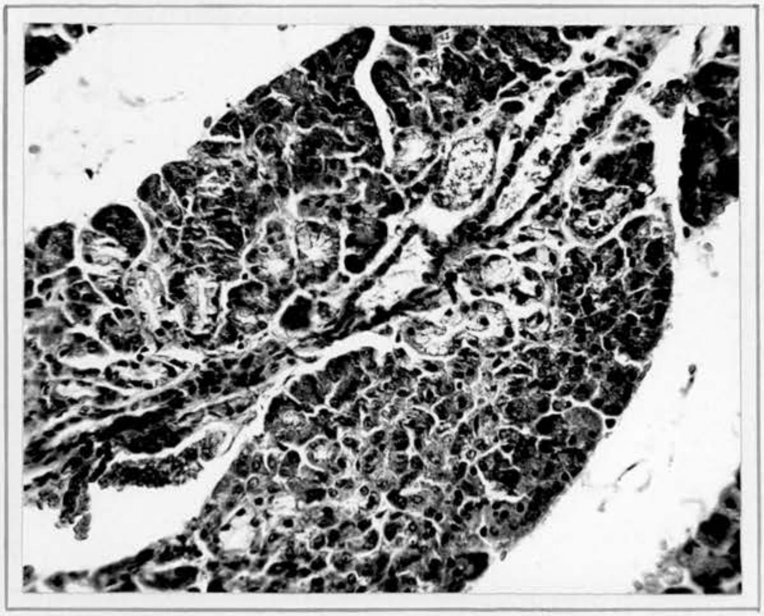


Fig. 32. Pancreas of Injected Rabbit 2. An interlobular duct runs diagonally upwards and to right at centre and has given off a number of small intralobular ducts above and below it. H.E. x 240.

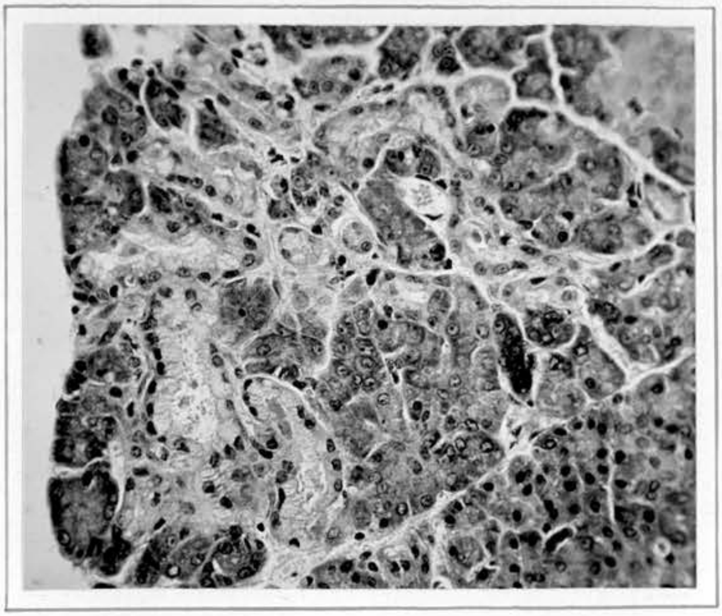


Fig. 33. Pancreas of Injected Rabbit 2. The tissue includes top and left a group of recently proliferated intralobular ducts lined by vacuolated epithelium. H.E. x 300.

to determine since the new channels usually twisted among the acini of the surrounding pancreatic tissue and were sectioned in various planes. Nevertheless, the occurrence of the channels in such groups was absolute evidence of a focal formation of entirely new ducts. The new channels were occasionally placed in immediate relation to and had obviously budded from a larger interlobular duct. No such relationship, however, was usually observed and the origin of the new ducts, therefore, was attributed to a local proliferation of the original small intra-lobular channels. The cells lining the proliferated ducts were often finely vacuolated or almost filled by a single large globule of fluid. They were consequently swollen into large cubical or even columnar structures, while the flattening of their nucleus against the cell base had often led to the formation of signet ring forms. The lumen of the ducts was also correspondingly reduced in size, but sometimes still contained acidophile secretion. Isolated ducts throughout the pancreas showed varying degrees of the same hydropic vacuolation and swelling of their epithelium. A frequent feature in relation to the swollen ducts, whether isolated or in groups, was the presence of masses of islet tissue (Figs. 34 - 39). These masses ranged in size between small collections of about six cells and islets which were almost as large as any in the tissue. They also varied/

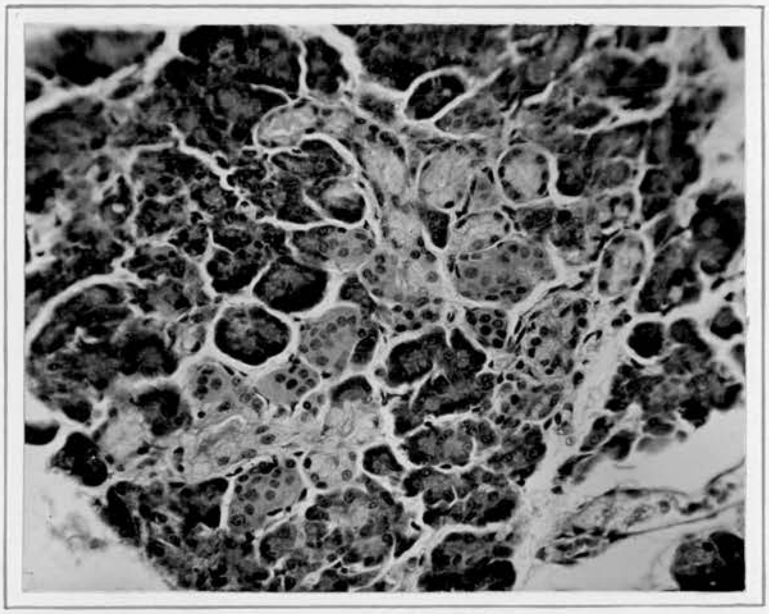


Fig. 34. Pancreas of Injected Rabbit 2.
Several small, newly formed islets have taken origin from a group of proliferated intra-lobular ducts lined by vacuolated epithelium. H.E. x 250.

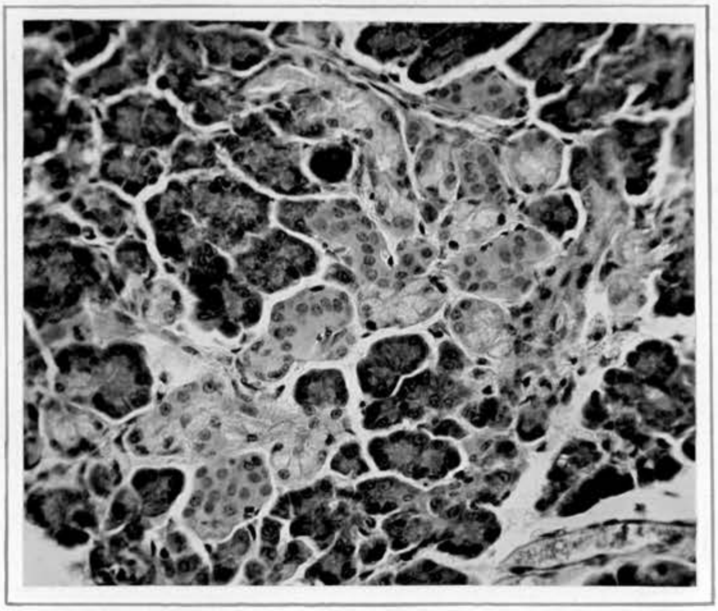


Fig. 35. Pancreas of Injected Rabbit 2.
Several small, newly formed islets are seen taking origin from a group of proliferated intralobular ducts with vacuolated epithelium. H.E. x 250.

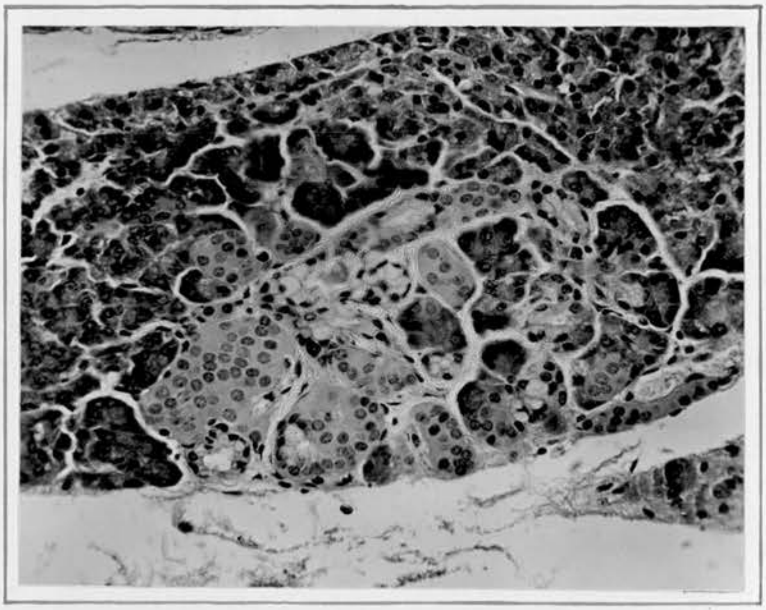


Fig. 36. Pancreas of Injected Rabbit 2.
Several small, newly formed islets have taken origin from a group of proliferated intralobular ducts with vacuolated epithelium. H.E. x 250.

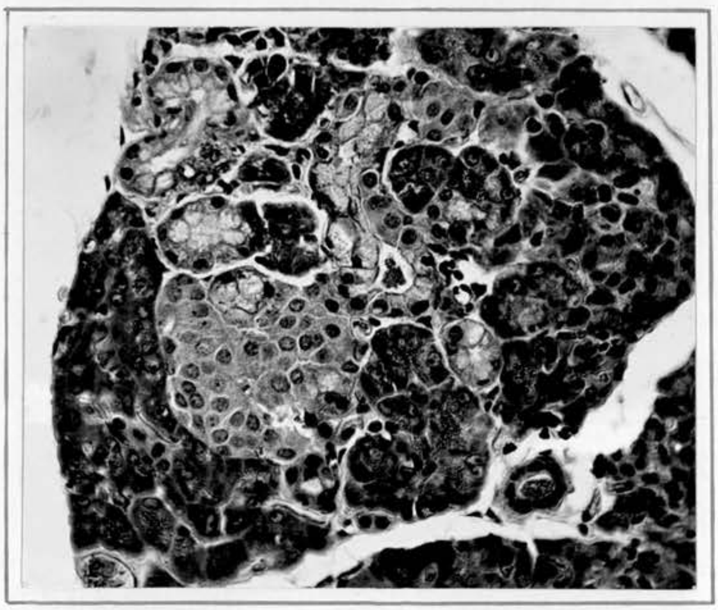


Fig. 37. Pancreas of Injected Rabbit 2.
Several newly formed intralobular ducts with vacuolated epithelium are present above and to left of centre. Recently differentiated islets, large and small, are placed at lower and upper ends of the central duct.
H.E. x 340.

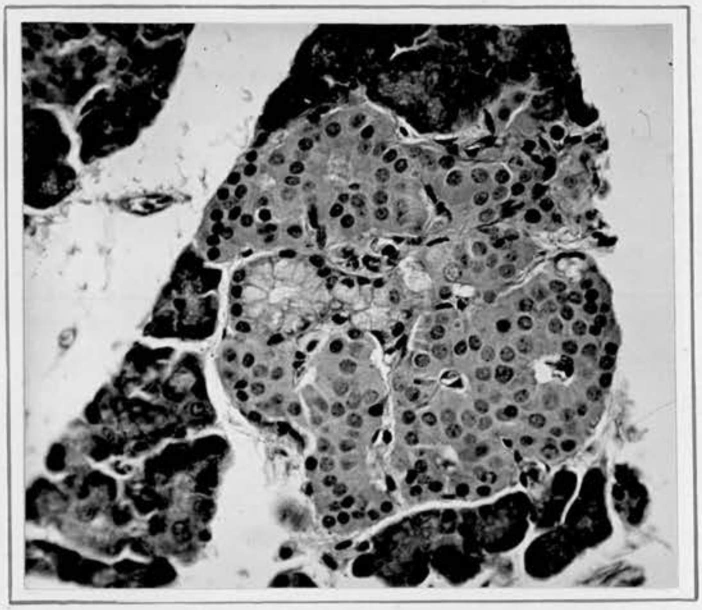


Fig. 38. Pancreas of Injected Rabbit 2. An intralobular duct immediately to left of centre and lined by vacuolated epithelium is almost completely buried in a newly formed islet. H.E. x 340.

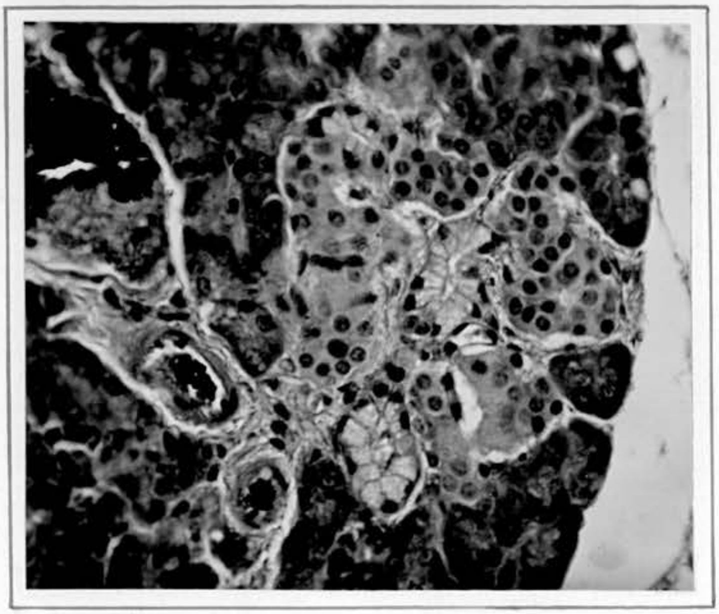


Fig. 39. Pancreas of Injected Rabbit 2. An intralobular duct with vacuolated epithelium seen to right of centre is enclosed by recently formed islet tissue. H.E. x 340.

varied in number. Thus, isolated ducts and some groups of ducts showed only one related islet, while the islets numbered from six to nine in other groups of ducts. The islets usually lay in juxtaposition to the ducts, but ducts were occasionally observed to be completely surrounded by islet tissue and direct continuity, moreover, was sometimes observed between the cells lining the ducts and those of the islets. The islet tissue in specially stained sections consisted of the usual proportion of A- and B- cells (Figs. 40 - 41). The excess of islets in relation to the proliferated ducts clearly indicated a formation of new islets, yet no mitotic figures were found in the epithelium of either ducts or islets. Microscopical examination of the pancreases of the injected rabbits and a comparison with control material thus indicated that the islets of the injected series were on the average enlarged, but not increased numerically, except in Rabbit 2 which showed a proliferation of its ducts and a differentiation therefrom of entirely new islets. These histological conclusions necessitated more accurate assessment and led to the following quantitative investigation.

(b) Quantitative Estimation. Results relative to weight of pancreas, weight of islet tissue, average weight of islets and number of islets for the twenty-eight injected rabbits and for ten control animals/

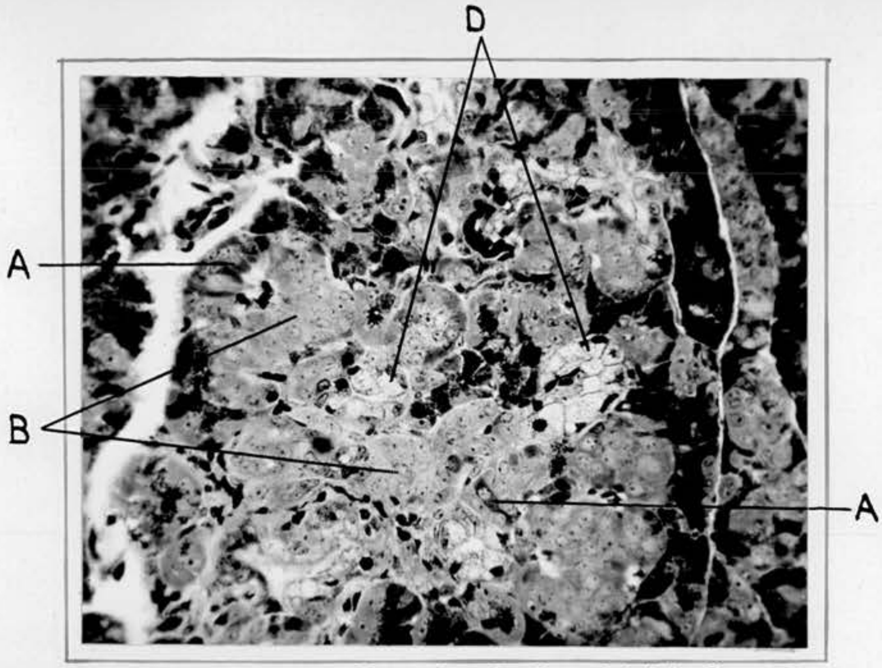


Fig. 40. Pancreas of Injected Rabbit 2. Two newly formed intralobular ducts lined by vacuolated epithelium (D) are placed in immediate relation to islet tissue consisting of darkly stained A-cells (A) and feebly stained B-cells (B). Heidenhain's Haematoxylin. x 300.

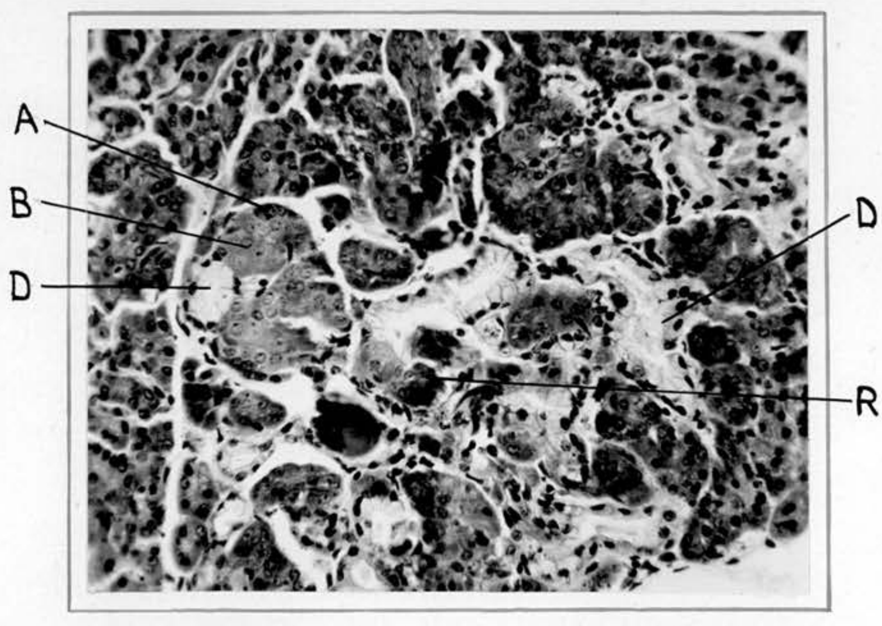


Fig. 41. Pancreas of Injected Rabbit 2. New intralobular ducts lined by vacuolated epithelium (D) are present at and to right and left of centre and show related islet tissue consisting of darkly stained A-cells (A) and feebly stained B-cells (B). A row of A-cells (R) apparently forms part of the wall of the central duct. Heidenhain's Haematoxylin. x 260.

animals are given in Tables V and VI respectively. The following points are noteworthy regarding the series of injected rabbits. The pancreas weighed from 1.0 g. in Rabbit 32 to 6.2 g. in Rabbit 10 and averaged 3.47 g. The islet tissue varied between 0.02 g. in Rabbit 32 and 0.32 g. in Rabbit 25 and was 0.09 g. on the average. The average weight of the islets as regards upper and lower limits was 0.217 γ in Rabbits 5 and 6 and 1.123 γ in Rabbit 26 respectively and had a mean value of 0.451 γ . Finally, the islets were as few as 44,000 in Rabbit 32 and as numerous as 442,000 in Rabbit 25, while the average number for the series was 202,000. The control series, on the other hand, yielded the following figures. The pancreas weighed from 1.95 g. in Rabbit 9 to 4.65 g. in Rabbit 4 and3.02 g. on the average. The islet tissue varied between 0.03 g. in Rabbits 6 and 9 and 0.09 g. in Rabbit 8 and averaged 0.05 g. The average weight of the islets was at least 0.128 γ in Rabbit 2 and at most 0.390 γ in Rabbit 8 and had a mean value of 0.230 γ . Finally, the islets numbered from 133,000 in Rabbit 9 to 402,000 in Rabbit 3, while their average number for the series was 240,000. The considerable variation in the weight of the pancreas of both injected and control rabbits suggests that the lowest and highest weights probably involve equivalent experimental errors as is to be expected from the difficulties/

TABLE V.

ISLET TISSUE OF INJECTED RABBITS

Rabbit	Weight of Pancreas	Weight of Islet Tissue	Average weight of Islets	Number of Islets
1	2.71 g.	0.04 g.	0.274 γ	146,000
2	2.34 g.	0.08 g.	0.340 γ	235,000
3	5.69 g.	0.06 g.	0.568 γ	108,000
4	2.76 g.	0.07 g.	0.253 γ	277,000
5	2.93 g.	0.06 g.	0.217 γ	277,000
6	3.12 g.	0.05 g.	0.217 γ	230,000
7	3.06 g.	0.04 g.	0.340 γ	118,000
8	3.70 g.	0.07 g.	0.445 γ	152,000
9	2.96 g.	0.08 g.	0.474 γ	159,000
10	6.20 g.	0.15 g.	0.504 γ	305,000
11	3.45 g.	0.05 g.	0.317 γ	151,000
12	3.71 g.	0.07 g.	0.568 γ	119,000
13	1.86 g.	0.03 g.	0.365 γ	79,000
14	2.48 g.	0.06 g.	0.235 γ	257,000
15	4.09 g.	0.17 g.	0.445 γ	376,000
17	3.18 g.	0.05 g.	0.365 γ	142,000
18	3.33 g.	0.13 g.	0.713 γ	175,000
20	1.74 g.	0.04 g.	0.274 γ	131,000
21	2.20 g.	0.05 g.	0.295 γ	169,000
22	4.90 g.	0.17 g.	0.474 γ	347,000
24	2.42 g.	0.05 g.	0.390 γ	123,000
25	6.08 g.	0.32 g.	0.713 γ	442,000
26	5.89 g.	0.29 g.	1.123 γ	261,000
28	3.76 g.	0.15 g.	0.880 γ	173,000
29	4.95 g.	0.09 g.	0.274 γ	334,000
30	3.03 g.	0.07 g.	0.675 γ	104,000
31	3.70 g.	0.10 g.	0.474 γ	212,000
32	1.00 g.	0.02 g.	0.445 γ	44,000
verage	3.47 g.	0.09 g.	0.451 γ	202,000
tandard Error	± 0.25	± 0.014	± 0.040 γ	± 18,000

TABLE VI

ISLET TISSUE OF CONTROL RABBITS

Rabbit	Weight of Pancreas	Weight of Islet Tissue	Average weight of Islets	Number of Islets
1	3.10 g.	0.06 g.	0.365 γ	172,000
2	2.43 g.	0.04 g.	0.128 γ	334,000
3	4.07 g.	0.06 g.	0.154 γ	402,000
4	4.65 g.	0.06 g.	0.217 γ	276,000
5	3.57 g.	0.05 g.	0.184 γ	268,000
6	2.40 g.	0.03 g.	0.168 γ	186,000
7	2.80 g.	0.06 g.	0.274 γ	225,000
8	3.00 g.	0.09 g.	0.390 γ	234,000
9	1.95 g.	0.03 g.	0.200 γ	133,000
10	2.19 g.	0.04 g.	0.217 γ	176,000
Average	3.02 g.	0.05 g.	0.230 γ	240,000
Standard Error	± 0.17	± 0.004	± 0.017 γ	± 16,000

difficulties of the technique. Such a statement also applies to the other data, but the averages of both series, nevertheless, are regarded as fairly accurate estimates.

The average weights of the pancreases of the injected and control rabbits were sufficiently similar to indicate no substantial change in the weight of the organ in the experimental animals. On the other hand, the injected series had an average of 0.09 g. of islet tissue compared with 0.05 g. for the control animals. The injected rabbits thus had on the average approximately twice as much islet tissue as the control group. Again, the average weight of the islets in the injected group was 0.451 γ and 0.230 γ for the control series. The islets of the injected animals as in the previous instance were thus on the average approximately twice as much in weight as those of the control rabbits (Figs. 42 and 43). The injected rabbits, finally, had an average of 202,000 compared with 240,000 in the control series. Considering the wide control variation, these figures indicated that the number of islets in the injected group was within normal range. The data thus justified the conclusions that the injected animals had approximately twice their normal weight of islet tissue and that this increase was due to an enlargement of the islets to approximately twice their original weight, while the islets/

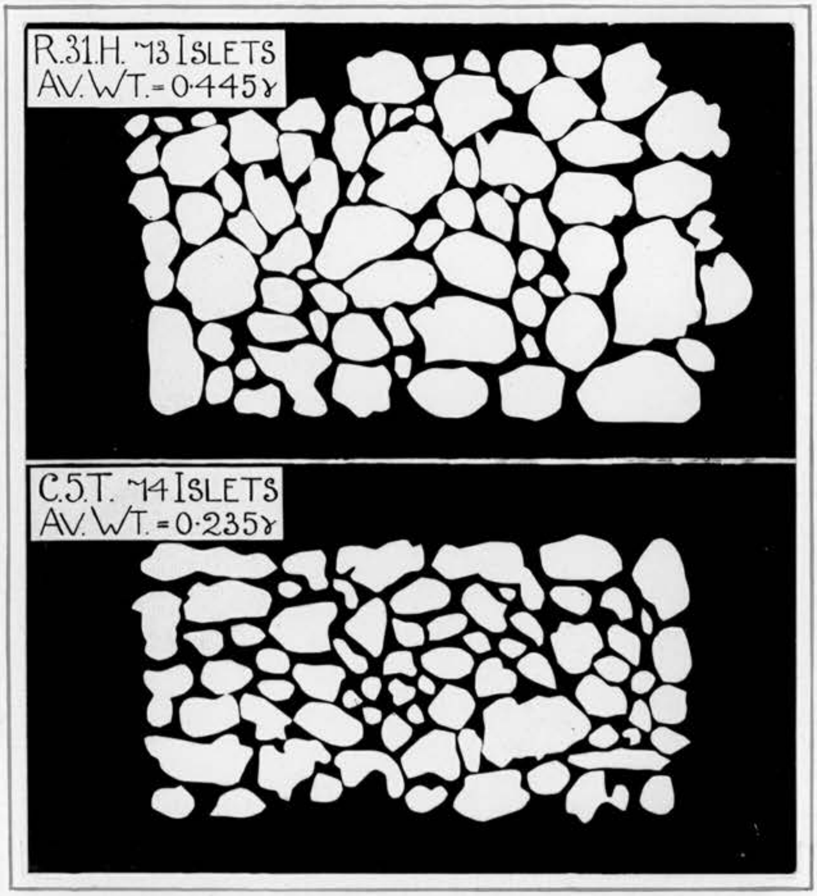


Fig. 42. The average weight (0.445 γ) of the upper group of 73 islets from head of pancreas of injected Rabbit 31 approximates closely to the average weight (0.451 γ) of the islets of the entire injected series, while the average weight (0.235 γ) of the lower group of 74 islets from tail of pancreas of control Rabbit 5 approximates closely to the average weight (0.230γ) of the islets of the entire control series. The upper group averages approximately double the size of the lower group.

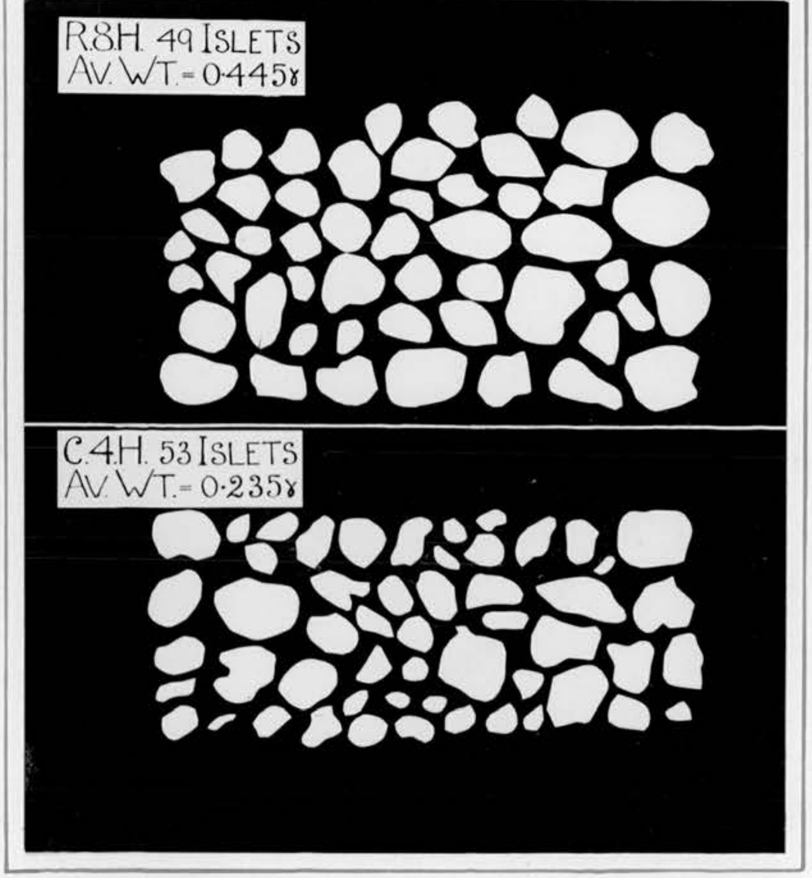


Fig. 43. The average weight (0.445 γ) of the upper group of 49 islets from head of pancreas of injected Rabbit 8 approximates closely to the average weight (0.451 γ) of the islets of the entire injected series, while the average weight (0.235 γ) of the lower group of 53 islets from head of pancreas of control Rabbit 4 approximates closely to the average weight (0.230 γ) of the islets of the entire control series. The upper group averages approximately double the size of the lower group.

islets remained constant in number. Such quantitative conclusions confirmed the assessment of the islet tissue made on microscopical examination. The latter, however, was additionally valuable in that it showed how the increase of islet tissue in Rabbit 2 involved not only hypertrophy of the islets, but also an increase in their number.

DISCUSSION.

The 28 rabbits which formed the basis of this investigation reacted in one or other of four ways to crude extract treatment and are consequently divisible into four groups. A first group of 18 rabbits was characterised by both glycosuria and ketonuria ; a second group of 5 rabbits showed glycosuria, but no ketonuria ; a third group of 2 rabbits manifested itself in ketonuria, but no glycosuria; and a fourth group of 3 rabbits exhibited neither glycosuria nor ketonuria. A total of 23 rabbits or 82 per cent of the series thus excreted sugar. The production of pituitary diabetes in rabbits has been attempted on a few previous occasions. Baumann and Marine (1932) using a crude saline extract produced glycosuria in each of 4 rabbits. Houssay, Biasotti and Rietti (1934) administered an alkaline extract to two rabbits without any effect in the way of sugar excretion. Finally, Young (1938) giving a crude extract by both subcutaneous and intraperitoneal/

intraperitoneal routes observed glycosuria in about 75 per cent of nearly 100 rabbits. The results of this and previous investigations thus indicate that in showing glycosuria as a response to extract treatment rabbits react positively in a proportion of cases only. Such a conclusion regarding rabbits may be compared with the reaction of other species. For example, Houssay, Biasotti and Rietti (1934) produced glycosuria in all of 22 dogs, while in 25 dogs Young (1938 A) recorded only one failure. Using cats, Houssay et al (1934) observed glycosuria in both of two cases and Young (1938 A) in four of eight animals. Houssay et al (1934) effected the excretion of sugar in each of 4 guinea-pigs, but no glycosuria appeared in any of the guinea-pigs treated by Young (1938 A). Finally, Houssay et al (1934) failed to observe glycosuria in groups of 10 rats and 5 mice and in both of these species Young (1938 A) obtained closely similar results. Such reports and the findings with regard to rabbits in this investigation indicate that the above-mentioned species, according to their susceptibility to diabetogenic anterior pituitary extract, may be divided into three groups - (1) dogs which are highly susceptible; (2) cats, rabbits and guinea-pigs which react in a percentage of cases ; and (3) rats and mice which are practically insensitive.

Young (1938 A), as already stated, produced glycosuria/

glycosuria in about 75 per cent of nearly 100 rabbits, but in only 50 per cent to the extent of more than 2 g. sugar per day and also observed an equivalent response on the part of the component Dutch, Himalayan, Belgian hare and sandy lop-eared strains. 85 per cent of the English rabbits in this research showed glycosuria and 74 per cent excreted more than 2 g. sugar per day. The English strain would thus appear to be definitely more reactive than several other strains of rabbit. The present rabbits, moreover, showed marked individual variation in their diabetic response. This response thus varied in onset between the second and ninth day of treatment and from three to twenty-three days in duration, while its peak occurred from the sixth to the twenty-second day of treatment and amounted to between 1.1 g. and 32.7 g. sugar per 24 hr. The conclusion already reached regarding variation in susceptibility of different species may consequently be broadened to apply also to strains and individual animals of the same strain.

The highest amounts of sugar excreted were 22.6 g., 27.5 g., and 32.7 g. per 24 hr. Baumann and Marine (1932) observed a maximum glycosuria of 34.9 g. per 24 hr., but Young (1938 A) recorded a peak sugar excretion of only 13.4 g. per 24 hr. The highest excretion of sugar in the present series was thus/

thus comparable with that observed by Baumann and Marine. No matter its severity or its duration, however, the glycosuria inevitably disappeared and this proved to be the case under treatment with a daily amount of extract which was both maintained constant and considerably increased at intervals of a few days. The only differences were that the animals receiving constant extract excreted sugar on the average for nine days and showed an average maximum glycosuria of 11.2 g. per 24 hr. compared with corresponding averages of eleven days and 8.6 g. per 24 hr. for the animals injected with increasing extract. Moreover, re-injection after the diabetic phase failed both in rabbits which had received constant and increasing extract to effect any further excretion of sugar. Baumann and Marine (1932) treated their 4 rabbits with constant extract and likewise produced in each case a glycosuria lasting at most 14 days. Young (1937, 1938 A) administering constant extract to dogs observed a transitory glycosuria. By increasing the extract, however, he caused the glycosuria to reappear only to disappear again after a few days. He was then able by increasing the extract at intervals to prevent subsidence of the glycosuria and ultimately to establish a marked glycosuria which persisted even after the withdrawal of extract. The rabbit thus differs materially from the dog in that both constant and/

and increasing extract is capable of rendering the rabbit permanently resistant to its diabetogenic influence. The development of such resistance might be explained in two ways. On the one hand, Collip and Anderson (1934, 1935) and Anderson and Collip (1934) have shown that animals treated with thyrotropic hormone develop in their serum a substance which neutralises the action of the hormone and the transitory nature of the glycosuria in the present rabbits might conceivably have been due to the development of an antihormone to the diabetogenic factor. The antithyrotropic hormone, however, takes on the average twenty-one days to develop and annul the action of the hormone, whereas the average duration of the glycosuria in this investigation was only eleven days. The definitely shorter duration of the glycosuria indicated the participation of a factor other than an antihormone, although that such an antihormone played at least some part cannot be completely discountenanced. On the other hand, Richardson and Young (1938) observed unusual mitotic activity in the islets of a dog which had become refractory to a crude diabetogenic extract and Rabbit 2 of this series showed a local proliferation of the small ducts in its pancreas and a differentiation therefrom of entirely new islets. These observations suggested that the transitoriness of the glycosuria in the English rabbit might find its explanation in an increase/

increase of islet tissue and consequently an enhanced source of insulin. This deduction was proved to be the case by a quantitative method which, although open to criticism in many ways, is nevertheless more reliable than any other known technique. The injected rabbits transpired to have a weight of islet tissue approximately twice that of the control series. This increase in the weight of islet tissue, moreover, was found to be due to an enlargement of the islets to approximately twice their original weight, while the islets remained constant in number. Rabbit 2 was an exception to this conclusion in that, as already stated, it showed evidence microscopically of a formation of new islets, but it was unique in this respect and must consequently be regarded as fortuitous. No evidence of mitotic division was found in the hypertrophied islets of any of the injected rabbits despite the fact that the islets must in many cases have been undergoing further enlargement at the time of the animal's death. The same statement is even applicable to Rabbit 2 in which active hyperplasia of ducts and islets was undoubtedly in progress when the animal died of acute pneumonia. Such a negative observation is in contrast with the frequency with which mitotic division was observed by Richardson and Young (1938), Richardson (1940) and Best, Campbell, Haist and Ham (1942) in the islets of diabetic or refractory dogs. Mitotic activity/

activity in the dogs, however, was associated with degranulation and hydrops of the beta cells and these degenerative phenomena may explain at least in part the occurrence of such unusual mitotic division. On the other hand, no degenerative changes were ever found in the islets of the present rabbits so that the original aims of the research as stated at the beginning were without success.

The increase of islet tissue in these rabbits is interesting in relation to the changes described in rats treated with anterior lobe extracts. Anselmino, Herold and Hoffmann (1933) injected rats for a few days with a watery extract of acetone-dried fresh anterior pituitary glands and claimed that this procedure effected a marked increase in the size and number of the pancreatic islets. They based their observations regarding the size and number of the islets merely on the microscopical examination of sections of the pancreases which is a method obviously conducive to faulty interpretation. Moreover, Richardson and Young (1937) were unable to support Anselmino et al with regard to the action of an extract prepared from acetone-dried material, but nevertheless showed by using a quantitative method for the assay of islet tissue that, when rats were treated daily for between two and three weeks with a saline extract of fresh anterior lobe, the islet tissue was doubled. They could not state from/

from their method of assay, however, whether the increase of islet tissue was due to an increase in the size or number of the islets or both. The degree of islet tissue increase in the present rabbits thus duplicates that produced in rats by Richardson and Young (1937) and further proves that the increase is due to hypertrophy of the islets and occasionally also to an increase in their number. Marks and Young (1939, 1940) subsequently proved that the daily administration of a crude anterior lobe extract to rats for two weeks leads to a rise in the insulin content of the pancreas to about twice the control value. This observation indicates that the hyperplastic islet tissue in the rat and presumably therefore in the rabbit is functionally active. It does not necessarily mean, however, that insulin is being secreted into the circulation at an abnormally rapid rate. Indeed, Richardson and Young (1937) found that the fasting blood sugar of their injected rats remained within normal range and a similar observation was made in some of the present rabbits after they had become refractory. Moreover, sugar tolerance tests carried out in the post-diabetic stage were normal. Even when Rabbit 12 was specially strained by using a 100 per cent glucose solution in the consecutive method, its sugar tolerance was of the same measure after as before the diabetic phase. The hyperplastic islet tissue, in other words, reacted merely to the required degree

and/

and no more. Nevertheless, the fact that it represented a greater quantity and source of insulin readily explained how re-injection of refractory rabbits failed to produce any further glycosuria. This point has also been discussed by Best, Haist and Ridout (1939).

The increase of islet tissue may have been compensatory to hyperglycaemia or brought about under the influence of a pancreotropic factor in the extract. Consideration in deciding between these alternatives must be given to the following facts. Five of the present rabbits never excreted sugar and presumably therefore maintained more or less normal blood sugars and yet, while one exception, had islets the average weight of which was greater than that of the islets of the control series. Rabbit 2 was one of these animals and besides having islets larger than the average showed a definite proliferation of its pancreatic ducts and a formation of entirely new islets. Richardson and Young (1937), moreover, found in their rats that the extract which increased the amount of islet tissue to twice that of controls had little or no effect on the level of the blood sugar. Finally, Best, Campbell, Haist and Ham (1942) noted that the simultaneous administration of anterior lobe extract and insulin tended to prevent degenerative islet changes, but did not eliminate the occurrence of mitotic figures. These combined observations indicate that the increase of islet tissue/

tissue is not compensatory to any hyperglycaemia, but probably due to the action of an independent pancreotropic factor. Marks and Young (1940) distinguish between the pancreotropic factor which increases the amount of islet tissue and the insulin-increasing factor which augments the quantity of extractable insulin. Since they are so closely related in action, these two factors, however, may fairly be assumed to be one and the same substance. The pancreotropic factor on the basis of this and other investigations is thus apparently able to stimulate (1) proliferation of the ducts of the pancreas; (2) differentiation from the proliferated ducts of new islets; (3) division of the islet cells with resultant hypertrophy of original islets; and (4) formation of insulin by the islet tissue.

The foregoing suggests that the variation in the reaction of different species such as the dog, rabbit and rat to diabetogenic anterior lobe extract depends in part on the relative susceptibility of the species to the diabetogenic and pancreotropic factors. Thus, the dog would appear to be highly susceptible to the diabetogenic factor and only slightly to the pancreotropic substance. The result is that the dog almost always reacts with marked hyperglycaemia and glycosuria and the islets endeavouring to compensate become degenerated and depleted of insulin [Campbell, Keenan and Best (1939); Best, Campbell and Haist (1939); Marks and Young (1939)] . The English rabbit is less affected/

affected by the diabetogenic substance and more by the pancreotropic factor. It consequently shows glycosuria in 85 per cent of cases, but the excretion of sugar is always neutralised by an increase in the amount of islet tissue to about double the normal. Finally, the rat appears to be practically insensitive to the diabetogenic factor and conversely sensitive to the pancreotropic substance. The effect is that it practically never excretes sugar and yet shows a marked increase in the amount both of islet tissue and pancreatic insulin.

That susceptibility to diabetogenic extract is also related in part to the original amount of pancreatic islet tissue is suggested by the following facts. Young (1941) found that puppies tolerate doses of crude anterior lobe extract greatly in excess of those required to produce glycosuria in adult dogs without exhibiting any signs of diabetes. Such a difference in susceptibility could be explained on the ground that puppies have relatively more islet tissue per kilogram of body weight than adult dogs and Ogilvie (1937) in support of this possibility has shown that human infants and adults have their islet tissue apportioned in this way. Lukens and Dohan (1942) using cats were able by partial pancreatectomy and subsequent extract treatment constantly to render them diabetic, whereas Young (1938 A) could make only 50 per cent of his cats glycosuric by extract alone.

In/

In this research, re-injection of rabbits which had shown transitory diabetes with more than originally effective amounts of extract failed to produce any further diabetes, presumably because the animals had by then acquired more islet tissue, and, therefore, available insulin. Variation in the reaction to diabetogenic extract thus apparently depends in part on relative susceptibility to the diabetogenic and pancreatropic factors and in part on the original amount of islet tissue and available insulin. This combination of influences, moreover, probably explains the variable reaction to diabetogenic extract not only of different species but also of different strains and different animals of the same strain.

The existence in ox anterior lobe extract of a pancreotropic factor suggests that the human anterior hypophysis may secrete a similar agent and a certain amount of evidence, indeed, exists to support this deduction. In the developing human pancreas, for example, the ducts according to Maximow and Bloom (1938) proliferate and differentiate into acini and islets. The islets continue to increase in number until the third year of postnatal life and growth of the islet tissue thereafter is effected merely by hypertrophy of existing islets (Ogilvie, 1937). These developmental features, as already seen, are essentially pancreotropic effects and the deduction,/

deduction, therefore, may reasonably be made that a pancreotropic factor is responsible for their production. It is also noteworthy that the anterior lobe extract in English rabbits produced hypertrophy of the islets much more commonly than an increase in their number. The cells of the existing islets, in other words, are more susceptible to the proliferative action of the pancreotropic factor than the cells of the ducts. This difference in susceptibility is perhaps natural since differentiation of islets from ducts comes to an end a long time before the islets cease to hypertrophy and presumably is correspondingly difficult to bring back into being as a generative mechanism. Hypertrophied islets also occur in obese subjects (Ogilvie, 1933, 1935) and in diabetics (Warren, 1938), and Young (1941, 1942 A & B) taking it as an indication of pancreotropic hyperfunction has incorporated this finding in a theory regarding the etiology of obesity.

The diminution of sugar tolerance during the diabetic phase as demonstrated by both single and consecutive methods confirms the observations of Houssay (1936) and Young (1939). The form of the single tolerance curve obtained during the diabetic phase means that the islets discharge sufficient insulin to cope adequately with the injected glucose during the first 20 minutes of the test, but that the supply of insulin thereafter rapidly and progressively/

progressively diminishes until only a very small amount of secretion is being passed out by the islets. Again, the falling character of the consecutive tolerance curve in the intact animal is a sign that each dose of glucose successively stimulates an increased secretion of insulin by the islets and the rising curve obtained in the diabetic animal indicates conversely that each subsequent dose of glucose is followed by a diminished output of insulin. These deductions regarding the secretion of insulin in turn suggest two observations concerning the state of the islets. First, the islets during the diabetic phase probably contain less than their normal amount of insulin. This idea is supported by the fact that Young (1940) observed a fall in the insulin content of the rabbit pancreas after extract treatment. This finding would at first appear to contradict what has already been said regarding an increase in the amount of islet tissue and presumably, therefore, of insulin in the rabbit pancreas. The two statements, however, are compatible in that a fall of pancreatic insulin may occur during the stage of diabetes whereas after recovery from the diabetogenic factor a rise is to be anticipated along with the increase in islet tissue. Secondly, the islets during the diabetic phase must be greatly depleted in regard of their ability to manufacture and secrete insulin. Both points/

points indicate that in attempting to overcome the action of the diabetogenic factor the islets have been reduced to a state of semi-exhaustion which, in the absence of their susceptibility to the pancreotropic factor, might have ended in severe degenerative changes as in the dog. Nevertheless, the fact that normal sugar tolerance curves were obtained by both single and consecutive methods three weeks after the diabetic phase is evidence of ultimate complete functional recovery of the islets. It is noteworthy that the sugar tolerance of two rabbits as determined during the first two days of the post-diabetic period was diminished. Recovery of the islets cannot, therefore, coincide with the cessation of glycosuria, but must be a relatively gradual process requiring several days. The significance of a normal sugar tolerance curve in the presence of an increased quantity of islet tissue has already been mentioned in relation to the rate of secretion of insulin by the hyperplastic tissue.

The diminished sensitivity to the hypoglycaemic action of insulin such as was observed during the diabetic phase in several animals confirms the findings of Houssay and Potick (1929), Benedetto (1933), Cope and Marks (1935) and Young (1938 B). The degree of insensitivity was variable. It was occasionally absolute, but on the average such that insulin/

insulin was at least four times less effective in lowering the blood sugar of the diabetic compared with the intact animal. The three responses of Rabbit 22 to the test dose of insulin, however, were instructive in that they varied inversely as the degree of glycosuria. The anti-insulin activity of anterior lobe extracts according to Cope and Marks (1935) and Young (1938 B, 1939) may also be observed at a time when the blood sugar is not significantly altered as, for example, in the dog during the latent period between the beginning of extract treatment and the development of glycosuria. These observations together indicate that diminution in the hypoglycaemic action of insulin is not an effect of any diabetogenic factor in the extract. Young (1938 B) has found that the responsible agent is also not identical with prolactin or with the thyrotropic or gonadotropic hormones and has suggested (Young, 1936) that it be known as the glycotropic factor. This factor, he believes, is the direct antagonist of insulin. Since insulin has a three-fold action in that it inhibits the formation of sugar from glycogen in the liver, facilitates the synthesis of glycogen from sugar in the muscles, and stimulates the oxidation of sugar by the peripheral tissues [Cori, Cori and Goltz (1923); Cori (1931); Best, Dale, Hoet and Marks (1926)], the glycotropic factor must, therefore, be regarded as having functions of an/

an opposite nature.

The fact that ketonuria occurred in about 70 per cent of the present animals agrees with the frequency with which Young (1938 A) observed the same phenomenon in his rabbits. Ketonuria resembled glycosuria in that it developed on the average on the sixth day and also ran a transitory course no matter whether the animal was treated with constant or increasing extract. Its duration, however, was slightly less than half that of the glycosuria so that the ketones had disappeared from the urine shortly before the glycosuria had reached its peak. The transitoriness of the ketonuria indicates just as in the case of the glycosuria that the animals developed a resistance to the mechanism whereby the extract effects the excessive production of ketones in the blood and the fact that re-injected animals failed to show any further ketonuria proves that within the scope of these experiments such refractoriness is permanent. The development of resistance to the ketogenic action of anterior pituitary extract has also been noted in rats by Black, Collip and Thomson (1934). On the other hand, Young (1939) in permanently diabetic dogs observed a progressive increase in ketonuria over periods of a year or more. The English rabbit and the dog thus differ markedly in that whereas the rabbit acquires permanent resistance to both the diabetogenic and ketogenic actions of the extract, the dog under/

under intensive treatment fails in both of these respects. Three of the rabbits in this investigation excreted more than 1,000 mg. and six rabbits more than 500 mg. of total ketones per 24 hr. These amounts compared with normal ketone excretion in the English rabbit indicate a substantially increased ketonuria and contrast with the statement by Young (1938 A) that the ketonuria in his rabbits was never very striking. Apart from the rabbit, ketonuria has been produced by anterior pituitary extracts in the rat [Burn and Ling (1930); Best and Campbell (1938); Gray (1938); Shipley and Long (1938)], dog [Rietti (1934) ; Young (1937, 1938 A)], guinea pig [Best and Campbell (1938) ; Young (1938 A)] and cat (Young, 1938 A). No agreement exists at the moment regarding the mechanism whereby anterior pituitary extract stimulates ketogenesis. Thus, Black, Collip and Thomson (1934) attribute the phenomenon to a specific ketogenic factor in the extract, while Shipley and Long (1938) believe that it is due to the inhibitory action of the extract on carbohydrate and protein catabolism.

The frequency of oliguria and the moderate degree of polyuria even in those rabbits exhibiting a urinary increase were noteworthy findings. The oliguria occurred despite considerable simultaneous glycosuria and polyuria was associated with glycosuria in only four animals. Such observations confirm/

confirm the results of Young (1938 A), but are not in agreement with those of Baumann and Marine (1932) who reported a marked polyuria in their treated rabbits. The urinary changes in the present investigation were distinctly related to dietary fluctuations. Thus, the oliguria occurring immediately after the start of treatment was always associated with a reduced food consumption, while the subsequent excretion of a normal or excessive amount of urine was accompanied by a corresponding increase in the intake of food. Young (1938 A) noted a similar diminution in the food consumption of his rabbits.

CONCLUSIONS.

(1) Twenty-eight rabbits of which twenty-seven were English and one Dutchreceived daily subcutaneous or intraperitoneal treatment with a crude saline extract of fresh ox anterior pituitary gland.

(2) Eighteen rabbits showed both glycosuria and ketonuria, five glycosuria only, two ketonuria only, and three neither glycosuria nor ketonuria.

(3) Both glycosuria and ketonuria were transitory despite intensive therapy and later treatment failed to produce any further phase of either phenomenon.

(4) Sugar tolerance and insulin sensitivity were definitely decreased during the diabetic phase, but/

but both tests were thereafter within normal range.

(5) The injected rabbits had approximately twice the weight of islet tissue compared with controls. This increase was due to a hypertrophy of the islets to about twice their original weight, while the number of islets remained constant. One rabbit was an exception in that the pancreas also showed a proliferation of its small ducts and a differentiation therefrom of entirely new islets.

(6) Crude anterior lobe extract has diabetogenic, pancreotropic, glycotropic and ketogenic actions. The incidence of experimental pituitary diabetes depends partly on the original amount of islet tissue and partly on relative species, strain and individual susceptibility to the diabetogenic and pancreotropic actions.

(7) Urine volume as a result of extract treatment is usually diminished at first and later either normal or moderately increased. The variations in urine volume are due to corresponding changes in food consumption.

REFERENCES.

Anderson, E.M. & Collip, J.B. 1934. Lancet 1. 784.

Anselmino, K.J., Herold, L., & Hoffman, F. 1933. Klin. Wschr. 12. 1245.

Baumann, E.J. & Marine, D., 1932. Proc. Soc. Exper. Biol. & Med. 29. 1220.

Benedetto, E. di, 1933. Compt. rend. Soc. de Biol. 112, 499.

Best, C.H. & Campbell, J. 1938. J. Physiol. 92. 91.

Best, C.H., Campbell, J., & Haist, R.E., 1939. J. Physiol. 97. 200.

Best, C.H., Campbell, J., Haist, R.E., & Ham, A.W. 1942. J. Physiol. 101. 17.

Best, C.H., Dale, H.H., Hoet, J.P. and Marks, H.P., 1926. Proc. Roy. Soc. Med. B. 100. 55.

Best, C.H., Haist, R.E., & Ridout, J.H., 1939. J. Physiol. 97. 107.

Black, P.T., Collip, J.B., & Thomson, D.L., 1934. J. Physiol. 82. 385.

Burn, J.H. & Ling, H.W., 1930. J. Physiol. 69. Proc. 19.

Campbell, J. & Best, C.H., 1938. Lancet 1. 1444.

Campbell, J., Keenan, H.C. & Best, C.H. 1939. Amer. J. Physiol. 126. Proc. 455.

Cecil, R.L., 1908. J. Exper. Med. 11. 266.

Collip, J.B. & Anderson, E.M. 1934. Lancet 1. 76.

Collip, J.B. & Anderson, E.M. 1935. J.A.M.A. 104. 965.

Cope, O. & Marks, H.P., 1935. J. Physiol. 83. 157.

Cori/

Cori, C.F., 1931. Physiol. Rev. 11. 143.

Cori, C.F., Cori, G.T., & Goltz, H.L., 1923. J. Pharmacol. 22. 355.

Dohan, F.C. & Lukens, F.D.W. 1939. Amer. J. Phys. 125. 188.

Evans, H.M., Meyer, K., Simpson, M.E., & Reichert, F.L. 1932. Proc. Soc. Exper. Biol. & Med., 29. 857.

Gray, C.H., 1938. Biochem. J. 32. 743.

Hamman, L. & Hirschman, I.I. 1919. Johns Hop. Hosp. Bull. 30. 306.

Himsworth, H.P., 1934. J. Physiol. 81. 29.

Houssay, B.A., 1936. New Eng. J. Med. 214. 961.

Houssay, B.A., Biasotti, A., & Rietti, C.T., 1932. Compt. rend. Soc. de Biol. 111. 479.

Houssay, B.A., Biasotti, A., & Rietti, C.T. 1934. Compt. rend. Soc. de Biol. 115. 325.

Houssay, B.A. & Potick, D. 1929. Compt. rend. Soc. de Biol. 101. 940.

Lukens, F.D.W., & Dohan, F.C. 1942. Endocrinol. 30. 175.

Marks, H.P. & Young, F.G. 1939. Chem. Ind. Rev. 58. 652.

Marks, H.P. & Young, F.G. 1940. Lancet. 1. 493.

Maximow, A.A., & Bloom, W. 1938. Textbook of Histology, 3rd. Edn. W.B. Saunders Co., Philadelphia & London.

Ogilvie, R.F. 1933. J. Path. Bact. 37. 473.

Ogilvie/

Ogilvie, R.F. 1935. Quart. J. Med. 28. 345.

Ogilvie, R.F. 1937. Quart. J. Med. 30. 287.

Opie, E.L. 1901. Exper. Med. 5. 397 & 527.

Richardson, K.C. 1940. Proc. Roy. Soc. Med. 128. 153.

Richardson, K.C., & Young, F.G. 1937. J. Physiol. 91. 352.

Richardson, K.C., & Young, F.G. 1938. Lancet. 1. 1098.

Rietti, C.T. 1934. Compt. rend. Soc. de Biol. 117. 57.

Shipley, R.A. & Long, C.N.H. 1938. Biochem. J. 32. 2242.

Warren, S. 1938. The Pathology of Diabetes Mellitus. Lea & Fibiger, Philadelphia.

Weichselbaum, A. 1911. Wien. Klin. Wchnschr. 24. 153.

Young, F.G. 1936. Lancet. 2. 297.

Young, F.G. 1937. Lancet. 2. 372.

Young, F.G. 1938 A. Biochem. J. 32. 513.

Young, F.G. 1938 B. Biochem. J. 32. 1521.

Young, F.G. 1939. New Eng. J. Med. 221. 635.

Young, F.G. 1940. Nature. 146. 31.

Young, F.G. 1941 Brit. M.J. 2. 897.

Young, F.G. 1942 A. J. Physiol. 100. Proc. 19.

Young, F.G. 1942 B. Biochem. J. 36. Proc. 2.

Protocols.

Rabbit 1. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
9.5.40	1828	85	-	-	-	-	-
10.5.40	1785	153	-	-	-	-	-
11.5.40	1814	110	-	-	-	-	-
12.5.40	1842	103	-	-	-	-	-
13.5.40	1817	100	-	-	-	-	-
14.5.40	1842	108	-	-	-	-	-
15.5.40	1857	145	-	-	-	-	0.5 g. per kg. (1.9 cc)
16.5.40	1814	86	-	-	-	-	0.5 g. per kg. (1.9cc.)
17.5.40	1871	105	-	-	-	-	0.5 g. per kg. (1.9 cc.)
18.5.40	1871	30	-	-	-	-	0.5 g. per kg. (1.9 cc.)
19.5.40	1814	60	-	-	-	-	0.5 g. per kg. (1.9 cc.)
20.5.40	1814	61	-	-	-	-	1 g. per kg. (3.6 cc.)
21.5.40	1814	91	-	-	-	-	1 g. per kg. (3.6 cc.)
22.5.40	1871	51	-	-	-	-	1 g. per kg. (3.8 cc.)
23.5.40	1814	123	-	-	-	-	1 g. per kg. (3.6 cc.)
24.5.40	1817	53	-	-	-	-	1 g. per kg. (3.8 cc.)
25.5.40	1899	83	-	-	-	-	1 g. per kg. (3.8 cc.)
26.5.40	1871	155	-	-	-	-	1 g. per kg. (3.8 cc.)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
27.5.40	1814	78	-	-	-	-	1.5 g. per kg. (5.4 cc.)
28.5.40	1785	72	-	-	-	-	1.5 g. per kg. (5.4 cc.)
29.5.40	1842	170	-	-	-	-	1.5 g. per kg. (5.7 cc.)
30.5.40	1700	107	-	-	-	-	1.5 g. per kg. (5.2 cc.)
31.5.40	1700	90	-	-	-	-	1.5 g. per kg. (5.2 cc.)
1.6.40	1700	93	-	-	-	-	1.5 g. per kg. (5.2 cc.)
2.6.40	1700	146	-	-	-	-	-
3.6.40	1700	95	-	-	-	-	-
4.6.40	1587	88	-	-	-	-	2 g. per kg. (6.4 cc.)
5.6.40	1530	113	-	-	-	-	2 g. per kg. (6.4 cc.)
6.6.40	1516	69	-	-	-	-	2 g. per kg. (6.4cc.)
7.6.40	1530	92	-	-	-	KILLED (PERITONITIS)	

Rabbit 2. (Female)

Date	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
22.6.40	1899	185	-	-	-	-	-
23.6.40	1871	185	-	-	-	-	-
24.6.40	1842	195	-	-	-	-	-
25.6.40	1871	150	-	-	-	-	1 g. per kg. (3.8 cc)
26.6.40	1871	127	-	-	-	-	1 g. per kg. (3.8 cc.)
27.6.40	1885	150	-	-	-	-	1 g. per kg. (3.8 cc.)
28.6.40	1857	191	-	-	-	-	1 g. per kg. (3.8 cc.)
29.6.40	1814	242	-	-	-	-	2 g. per kg. (7.2 cc.)
30.6.40	1814	276	-	-	-	-	-
1.7.40	1814	230	-	-	-	-	1.5 g. per kg. (5.4 cc.)
2.7.40	1842	200	-	-	-	-	1.5 g. per kg. (5.4 cc.)
3.7.40	1757	283	-	-	-	-	1.5 g. per kg. (5.4 cc.)
4.7.40	1700	238	-	-	-	-	1.5 g. per kg. (5.2 cc.)
5.7.40	1700	298	-	-	-	-	1.5 g. per kg. (5.2 cc.)
6.7.40	1700	260	-	-	-	-	2 x 1.5 g. per kg. (9 cc.)
7.7.40	1615	227	-	-	-	-	-
8.7.40	1530	259	-	-	KILLED (Ac. Bronchopneumonia).		

Rabbit 3. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
1.7.40	1615	136	-	-	-	-	-
2.7.40	1615	138	-	-	-	-	-
3.7.40	1587	158	-	-	-	-	-
4.7.40	1573	152	-	-	-	-	-
5.7.40	1615	89	-	-	-	-	-
6.7.40	1644	120	-	-	-	-	-
7.7.40	1644	183	-	-	-	-	-
8.7.40	1644	128	-	-	-	-	-
9.7.40	1700	170	-	-	-	-	-
10.7.40	1644	149	-	-	-	-	-
11.7.40	1700	190	-	-	-	-	1 g. per kg. (3.4 cc.)
12.7.40	1644	194	-	-	-	-	1 g. per kg. (3.4 cc.)
13.7.40	1700	118	-	-	-	-	2 g. per kg. (6.8 cc.)
14.7.40	1700	157	-	-	-	-	-
15.7.40	1672	174	-	-	-	-	1 g. per kg. (3.4 cc.)
16.7.40	1700	133	0.05	0.06	-	-	1 g. per kg. (3.4 cc.)

<u>DIED</u> (Peritonitis).

Rabbit 4. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
14.7.40	1502	85	-	-	-	-	-
15.7.40	1473	162	-	-	-	-	-
16.7.40	1473	130	-	-	-	-	-
17.7.40	1502	153	-	-	-	-	-
18.7.40	1530	141	-	-	-	-	-
19.7.40	1530	122	-	-	-	-	1 g. per kg. (3.1 cc.)
20.7.40	1530	153	-	-	-	-	2 g. per kg. (6.2 cc.)
21.7.40	1530	132	-	-	-	-	-
22.7.40	1530	137	-	-	-	-	1 g. per kg. (3.1 cc.)
23.7.40	1530	58	-	-	-	-	1g. per kg. (3.1 cc.)
24.7.40	1544	146	-	-	-	-	1 g. per kg. (3.1 cc.)
25.7.40	1587	153	-	-	-	-	1.5 g. per kg. (4.8 cc.)
26.7.40	1587	107	-	-	-	-	1.5 g. per kg. (4.8 cc.)
27.7.40	5173	147	-	-	-	-	2 x 1.5 g. per kg. (9.6 cc.)
28.7.40	1587	122	-	-	-	-	-
29.7.40	1643	132	-	-	-	-	1.5 g. per kg. (4.8 cc.)
30.7.40	1700	113	-	-	-	-	1.5 g. per kg. (4.8 cc.)
31.7.40	1643	195	-	-	-	-	2 g. per kg. (6.4 cc)

1.8.40/

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
1.8.40	1729	120	-	-	-	-	2 g. per kg. (6.4 cc.)
2.8.40	1700	135	-	-	-	-	2 g. per kg. (6.4 cc.)
3.8.40	1587	274	-	-	-	-	2 x 2 g. per kg. (12.8 cc.)
4.8.40	1587	55	-	-	-	-	-
5.8.40	1587	270	-	-	-	-	2 g. per kg. (6.4 cc.)
6.8.40	1587	252	-	-	-	-	2 g. per kg. (6.4 cc.)
7.8.40	1530	160	-	-	-	-	2.5 g. per kg. (7.6 cc.)
8.8.40	1473	73	-	-	-	DIED	(Exhaustion)

Rabbit 5. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Blood Sugar in mg.%	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
31.7.40	1729	176	-	-	-	-	-	-
1.8.40	1785	234	-	-	-	-	-	-
2.8.40	1757	200	-	-	-	-	-	-
3.8.40	1700	165	-	-	-	-	-	-
4.8.40	1729	168	-	-	-	-	-	-
5.8.40	1757	183	-	-	-	-	-	-
6.8.40	1757	197	-	-	-	-	-	-
7.8.40	1757	265	-	-	-	-	-	-
8.8.40	1757	185	152	-	-	-	-	-
9.8.40	1757	164	-	-	-	-	-	1 g. per kg. (3.6 cc.)
10.8.40	1814	167	155	-	-	-	-	2 x 1 g. per kg. (7.2 cc.)
11.8.40	1785	118	-	-	-	-	-	-
12.8.40	1842	150	-	-	-	-	-	1 g. per kg. (3.8 cc.)
13.8.40	1842	157	-	-	-	-	-	1 g. per kg. (3.8 cc.)
14.8.40	1814	212	-	0.05	0.1	-	-	1 g. per kg. (3.6 cc.)
15.8.40	1871	150	-	0.1	0.2	-	-	1.5 g. per kg. (5.7 cc.)
16.8.40	1899	148	-	0.1	0.2	-	-	1.5 g. per kg. (5.7 cc.)
17.8.40	1885	180	166	0.2	0.3	-	-	2 x 1.5 g. per kg. (11.4 cc.)
18.8.40	1814	225	-	0.06	0.1	-	-	-
19.8.40	1814	138	-	0.1	0.2	-	-	1.5 g. per kg. (5.4 cc.)
20.8.40	1814	136	-	0.2	0.2	-	-	1.5 g. per kg. (5.4 cc.)

Date.	Body Weight in g.	Urine Volume in cc.	Blood Sugar in mg.%	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
21.8.40	1842	206	-	0.5	1.0	-	-	2 g. per kg. (7.2 cc.)
22.8.40	1871	145	-	0.4	0.6	-	-	2 g. per kg. (7.4 cc.)
23.8.40	1871	156	232	2.0	3.1	-	-	2 g. per kg. (7.4 cc.)
24.8.40	1814	188	-	3.1	5.8	-	-	2 g. per kg. (7.3 cc.)
25.8.40	1814	166	-	3.0	5.0	-	-	2.5 g. per kg. (9.0 cc.)
26.8.40	1785	213	-	0.6	1.4	-	-	2.5 g. per kg. (9.0 cc.)
27.8.40	1757	230	-	0.7	1.5	-	-	-
28.8.40	1672	160	-	0.1	0.2	-	-	-
29.8.40	1587	257	95	-	-	-	<u>KILLED</u>.	

Rabbit 6. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
20.9.40	2041	139	-	-	-	-	-
21.9.40	2027	202	-	-	-	-	-
22.9.40	2041	93	-	-	-	-	-
23.9.40	1998	240	-	-	-	-	-
24.9.40	2069	270	-	-	-	-	-
25.9.40	2041	220	-	-	-	-	-
26.9.40	2097	142	-	-	-	-	-
27.9.40	1984	140	-	-	-	-	-
28.9.40	2012	101	-	-	-	-	-
29.9.40	2041	191	-	-	-	-	-
30.9.40	2055	81	-	-	-	-	-
1.10.40	2041	108	-	-	-	-	1 g. per kg. (4 cc.)
2.10.40	2097	100	-	-	-	-	1 g. per kg. (4.2 cc.)
3.10.40	1984	115	-	-	-	-	1 g. per kg. (4 cc.)
4.10.40	1927	64	-	-	-	-	1 g. per kg. (3.8 cc.)
5.10.40	1998	134	-	-	-	-	2 x 1 g.per kg. (8 cc.)
6.10.40	-	34	-	-	+	+	-
7.10.40	1927	140	-	-	-	-	1.5 g. per kg. (5.8 cc.)
8.10.40	1984	76	-	-	+	+	1.5 g. per kg. (6 cc.)
9.10.40	1927	95	-	-	-	-	1.5 g. per kg. (5.7 cc.)
10.10.40	1927	110	-	-	-	-	1.5 g. per kg. (5.7 cc.)
11.10.40	1899	95	-	-	-	-	1.5 g. per kg. (5.7 cc.)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
12.10.40	1927	112	-	-	-	-	2 x 2.0 g.per kg. (15.2cc).
13.10.40	1814	149	-	-	-	-	-
14.10.40	1842	172	-	-	-	-	2.0 g. per kg. (7.2 cc.)
15.10.40	1899	178	-	-	-	-	2.0 g. perkg. (7.6 cc.)
16.10.40	1956	85	-	-	-	-	2.0 g. per kg. (8 cc.)
17.10.40	1729	340	-	-	-	-	2.5 g. per kg. (9.0 cc.)
18.10.40	1714	392	-	-	-	-	2.5 g. per kg. (8.6 cc.)
19.10.40	1757	289	-	-	-	-	2 x 2.5 g. per kg. (18 cc.)
20.10.40	-	520	-	-	-	-	-
21.10.40	1743	134	-	-	-	-	-
22.10.40	1558	360	-	-	-	-	KILLED.

Rabbit 7. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
19.10.40.	1771	236	-	-	-	-	-
20.10.40	1778	196	-	-	-	-	-
21.10.40	1785	101	-	-	-	-	-
22.10.40	1799	258	-	-	-	-	-
23.10.40	1806	147	-	-	-	-	-
24.10.40	1785	200	-	-	Blank = 20 *	-	-
25.10.40	1700	67	-	-	-	-	-
26.10.40	1771	120	-	-	-	-	-
27.10.40	1793	200	-	-	-	-	-
28.10.40	1814	139	-	-	-	-	-
29.10.40	1785	191	-	-	-	-	1.0 g. per kg. (3.6 cc.)
30.10.40	1857	151	-	-	-	-	1.0 g. per kg. (3.8 cc.)
31.10.40	1842	110	-	-	-	-	1.0 g. per kg. (3.8 cc.)
1.11.40	1871	76	-	-	-	-	1.0 g. per kg. (3.8 cc.)
2.11.40	1871	144	-	-	-	-	2.5 g. per kg. (9.6 cc.)
3.11.40	-	74	-	-	-	-	-
4.11.40	1842	141	-	-	-	-	1.5 g. per kg. (5.8 cc.)
5.11.40	1814	91	-	-	100	91	1.5 g. per kg. (5.4 cc.)
6.11.40	1814	125	0.1	0.1	134	168	1.5 g. per kg. (5.4 cc.)
7.11.40	1842	121	3.0	3.6	109	132	2.0 g. per kg. (7.6 cc.)
8.11.40	1842	133	5.5	7.3	154	205	2.0 g. per kg. (7.6 cc.)

* Blank has not been deducted from either percentage or total ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
9.11.40	1871	172	0.8	1.4	-	-	2.0 g. per kg. (7.6 cc.)
10.11.40	-	183	0.1	0.2	-	-	2.0 g. per kg. (7.6 cc.)
11.11.40	1871	233	0.1	0.2	-	-	2.5 g. per kg. (9.5 cc.)
12.11.40	1871	248	0.1	0.1	-	-	2.45 g. per kg. (9.1 cc.)
13.11.40	1842	198	-	-	-	-	-
14.11.40	1814	145	0.2	0.2	-	-	-

DIED.

SUGAR TOLERANCE :

CONSECUTIVE METHOD.

Date.	Blood Sugar in mg. per cent.								
	Fasting.	5 min.	28 min.	35 min.	58 min.	65 min.	88 min.	95 min.	118m.
5.10.40	110	274	163	270	151	264	133	254	160
5.11.40	98	218	154	231	156	313	169	349	170

Rabbit 8. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
12.11.40	2260	95	-	-	-	-	-
13.11.40	2239	239	-	-	-	-	-
14.11.40	2239	172	-	-	Blank = 30*	-	-
15.11.40	2239	180	-	-	-	-	-
16.11.40	2239	204	-	-	-	-	-
17.11.40	-	228	-	-	-	-	-
18.11.40	2183	194	-	-	-	-	-
19.11.40	2154	174	-	-	-	-	-
20.11.40	2154	187	-	-	-	-	-
21.11.40	2211	176	-	-	-	-	1.0 g. per kg. (4.4 cc.)
22.11.40	2211	170	-	-	-	-	1.0 g. per kg. (4.4 cc.)
23.11.40	2154	129	-	-	140	181	2 x 1.0 g. per kg. (8.4 cc.)
24.11.40	-	23	0.20	0.05	294	68	-
25.11.40	2097	28	0.08	0.02	106	30	1.0 g. per kg. (4.2 cc.)
26.11.40	2097	32	0.06	0.02	99	32	-

<u>DIED</u>.

* Blank has been deducted from both percentage and total ketones.

Rabbit 9. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
27.11.40	1615	138	-	-	-	-	-
28.11.40	1587	208	-	-	-	-	-
29.11.40	1615	178	-	-	-	-	-
30.11.40	1558	148	-	-	-	-	-
1.12.40	-	150	-	-	-	-	-
2.12.40	1558	194	-	-	-	-	-
3.12.40	1615	164	-	-	-	-	-
4.12.20	1643	169	-	-	-	-	1.0 g. per kg. (3.2 cc.)
5.12.40	1757	108	-	-	-	-	1.0 g. per kg. (3.6 cc.)
6.12.40	1729	143	-	-	-	-	1.0 g. per kg. (3.4 cc.)
7.12.40	1643	230	-	-	-	-	2 x 1.0 g. per kg. (6.4 cc.)
8.12.40	-	50	-	-	-	-	-
9.12.40	1672	120	-	-	-	-	1.5 g. per kg. (5.2 cc.)
10.12.40	1700	128	-	-	-	-	1.5 g. per kg. (5.2 cc.)
11.12.40	1729	181	-	-	-	-	1.5 g. per kg. (5.2 cc.)
12.12.40	1729	170	0.3	0.6	-	-	1.5 g. per kg. (5.2 cc.)
13.12.40	1700	31	-	-	-	-	1.5 g. per kg. (5.2 cc.)
14.12.40	1785	169	0.4	0.6	-	-	2.0 g. per kg. (7.2 cc.)
15.12.40	-	180	0.3	0.6	-	-	-
16.12.40	1757	265	-	-	-	-	2.0 g. per kg. (6.8 cc.)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
17.12.40	1785	180	-	-	-	-	2.0 g. per kg. (7.2cc.)
18.12.40	1814	241	2.5	6.0	-	-	2.0 g. per kg. (7.2 cc.)
19.12.40	1814	221	2.3	5.1	-	-	2.0 g. per kg. (7.2 cc.)
20.12.40	1785	232	6.6	15.3	-	-	2.0 g. per kg. (7.2 cc.)
21.12.40	1785	205	3.3	6.8	-	-	2.5 g. per kg. (9 cc.)
22.12.40	-	218	0.3	0.7	-	-	2.5 g. per kg. (9 cc.)
23.12.40	1814	217	-	-	-	-	2.5 g. per kg. (9 cc.)
24.12.40	1799	201	-	-	-	-	2.5 g. per kg. (9 cc.)
25.12.40	1806	209	-	-	-	-	-
26.12.40	1785	218	-	-	-	-	-
27.12.40	1785	182	-	-	-	KILLED.	

SUGAR TOLERANCE CURVE :

CONSECUTIVE METHOD.

te.	Blood Sugar in mg. per cent.								
	Fasting	5 min.	28min.	35min.	58min.	65min.	88 min.	95min.	118min.
.12.40	110	214	147	239	156	264	163	266	174

Rabbit 10. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
31.12.40	1814	152	-	-	-	-	-
1.1.41	1814	180	-	-	-	-	-
2.1.41	1871	174	-	-	-	-	-
3.1.41	1956	151	-	-	Blank = 35*	-	-
4.1.41	1871	170	-	-	-	-	-
5.1.41	-	185	-	-	-	-	-
6.1.41	1956	173	-	-	-	-	-
7.1.41	1927	181	-	-	-	-	-
8.1.41	1956	122	-	-	-	-	-
9.1.41	1984	131	-	-	-	-	1.0 g. per kg. (4 cc.)
10.1.41	1984	109	-	-	-	-	1.0 g. per kg. (4 cc.)
11.1.41	1927	110	-	-	-	-	2 x 1.0 g. per kg. (7.6 cc.)
12.1.41	-	83	-	-	12	10	-
13.1.41	1956	106	-	-	-	-	1.0 g. per kg. (3.8 cc.)
14.1.41	1871	80	0.7	0.6	10	8	1.5 g. per kg. (5.8 cc.)
15.1.41	1871	65	1.8	1.2	184	120	1.5 g. per kg. (5.8 cc.)
16.1.41	1842	101	3.7	3.7	539	544	1.5 g. per kg. (5.8 cc.)
17.1.41	1757	60	6.7	4.0	159	95	1.5 g. per kg. (5.4 cc.)
18.1.41	1814	80	2.0	1.6	131	105	1.5 g. per kg. (5.4 cc.)
19.1.41	-	106	2.8	3.0	54	57	1.5 g. per kg. (5.4 cc.)
20.1.41	1871	129	3.3	4.3	-	-	2.0 g. per kg. (7.6 cc.)

* Blank has been deducted from both percentage and total ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
21.1.41	1899	110	1.9	2.1	-	-	2.0 g. per kg. (7.6 cc.)
22.1.41	1927	146	2.3	3.4	-	-	2.0 g. per kg. (7.6 cc.)
23.1.41	1927	114	0.9	1.0	-	-	2.0 g. per kg. (7.6 cc.)
24.1.41	1814	143	-	-	-	-	-
25.1.41	1530	190	-	-	-	-	-
26.1.41	-	140	-	-	-	-	-
27.1.41	1643	72	-	-	-	-	-
28.1.41	1700	47	-	-	-	-	-
29.1.41	1700	143	-	-	-	-	-
30.1.41	1729	110	-	-	-	-	-
31.1.41	1757	90	-	-	-	-	-
1.2.41	1757	66	-	-	-	-	-
2.2.41	-	116	-	-	-	-	-
3.2.41	1814	73	-	-	-	-	-
4.2.41	1785	196	-	-	-	-	-
5.2.41	1814	185	-	-	-	-	-
6.2.41	1814	115	-	-	-	-	-
7.2.41	1814	147	-	-	-	-	-
8.2.41	1871	84	-	-	-	-	-
9.2.41	-	169	-	-	-	-	-
10.2.41	1871	111	-	-	-	-	-
11.2.41	1871	169	-	-	-	-	-
12.2.41	1814	134	-	-	-	-	-
13.2.41	1871	116	-	-	-	-	-
14.2.41	1814	88	-	-	-	-	-

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
15.2.41	1899	83	-	-	-	-	-
16.2.41	-	158	-	-	-	-	-
17.2.41	1956	160	-	-	-	-	-
18.2.41	1984	117	-	-	-	-	-
19.2.41	1984	197	-	-	-	-	-
20.2.41	1956	180	-	-	-	-	-
21.2.41	1984	156	-	-	-	-	1.0 g. per kg. (4 cc.)
22.2.41	2041	95	-	-	-	-	2 x 1.0 g. per kg (8 cc.)
23.2.41	-	100	-	-	-	-	-
24.2.41	2055	96	-	-	-	-	1.0 g. per kg. (4 cc.)
25.2.41	2069	105	-	-	-	-	1.0 g. per kg. (4.2 cc.)
26.2.41	2083	152	-	-	-	-	1.5 g. per kg. (6.4 cc.)
27.2.41	2097	127	-	-	-	-	1.5 g. per kg. (6.4 cc.)
28.2.41	2097	228	-	-	-	-	1.5 g. per kg. (6. 4 cc.)
1.3.41	2069	136	-	-	-	-	1.5 g. per kg. (6.4 cc.)
2.3.41	-	162	-	-	-	-	1.5 g. per kg. (6.4 cc.)
3.3.41	1984	23	-	-	-	DIED.	

SUGAR TOLERANCE CURVE: (Rabbit 10)

CONSECUTIVE METHOD.

ate.	Blood Sugar in mg. per cent.								
	Fasting	5min.	28min.	35min.	58min.	65min.	88min.	95min.	118min.
..41	131	268	205	224	131	189	169	201	172
1.41	191	289	236	330	255	340	312	408	316
2.41	122	262	192	278	171	239	144	258	140

Rabbit 11. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
15.1.41	1700	68	-	-	-	-	-
16.1.41	1672	140	-	-	-	-	-
17.1.41	1643	130	-	-	-	-	-
18.1.41	1643	111	-	-	Blank = 40*	-	-
19.1.41	-	133	-	-	-	-	-
20.1.41	1700	115	-	-	-	-	-
21.1.41	1700	146	-	-	-	-	-
22.1.41	1700	151	-	-	-	-	-
23.1.41	1700	94	-	-	-	-	-
24.1.41	1700	106	-	-	-	-	-
25.1.41	1729	142	-	-	-	-	-
26.1.41	-	151	-	-	-	-	-
27.1.41	1729	95	-	-	-	-	-
28.1.41	1700	72	-	-	-	-	-
29.1.41	1729	100	-	-	-	-	1.0 g. per kg. (3.4 cc.)
30.1.41	1700	38	-	-	-	-	1.0 g. per kg. (3.4 cc.)
31.1.41	1700	58	-	-	-	-	1.0 g. per kg. (3.4 cc.)
1.2.41	1700	20	-	-	-	-	2 x 1 g.per kg. (6.8 cc.)
2.2.41	-	61	-	-	124	51	-
3.2.41	1757	170	-	-	-	-	1.5 g. per kg. (5.4 cc.)
4.2.41	1757	136	7.7	10.5	129	121	1.5 g. per kg. (5.4 cc.)
5.2.41	1757	157	9.4	14.8	232	201	1.5 g. per kg. (5.4 cc.)

* Blank has been deducted from total, but not from percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
6.2.41	1757	125	6.0	7.5	527	609	1.5 g. per kg. (5.4 cc.)
7.2.41	1700	63	5.3	3.3	701	404	1.5 g. per kg. (5.4 cc.)
8.2.41	1729	80	5.0	4.0	86	37	1.5 g. per kg. (5.4 cc.)
9.2.41	-	64	6.7	4.3	55	10	1.5 gper kg. (5.4 cc.)
10.2.41	1785	105	7.0	7.4	30	-	1.5 g. per kg. (5.4 cc.)
11.2.41	1785	156	5.5	8.6	-	-	1.5 g. per kg. (5.4 cc.)
12.2.41	1814	152	2.8	4.3	-	-	1.5 g. per kg. (5.4 cc.)
13.2.41	1757	116	3.0	3.5	-	-	1.5 g. per kg. (5.4 cc.)
14.2.41	1871	51	1.1	0.6	-	-	1.5 g. per kg. (5.8 cc.)
15.2.41	1757	181	0.9	1.6	-	-	1.5 g. per kg. (5.4 cc.)
16.2.41	-	127	0.04	0.1	-	-	1.5 g. per kg. (5.4 cc.)
17.2.41	1814	87	0.5	0.4	-	-	1.5 g. per kg. (5.4 cc.)
18.2.41	1814	111	-	-	-	-	2.0 g. per kg. (7.2 cc.)
19.2.41	1814	128	-	-	-	-	2.0 g. per kg. (7.2 cc.)
20.2.41	1814	139	-	-	-	-	2.0 g. per kg. (7.2 cc.)
21.2.41	1700	35	-	-	-	-	-
22.2.41	1714	200	-	-	-	-	-
23.2.41	-	143	-	-	-	-	-
24.2.41	1601	86	-	-	-	-	-

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
25.2.41	1629	76	-	-	-	-	-
26.2.41	1643	60	-	-	-	-	-
27.2.41	1587	43	-	-	-	-	-
28.2.41	1587	35	-	-	-	-	-

13.3. 41 <u>KILLED</u>.

SUGAR TOLERANCE CURVE:

CONSECUTIVE METHOD.

Date.	Blood Sugar in mg. per cent								
	Fasting	5min.	28min.	35min.	58min.	65min.	88min.	95min.	118min.
.1.41	129	282	212	345	224	351	230	363	224
2.41	171	306	252	395	311	452	306	513	345
. 3.41	119	268	183	315	199	319	203	306	172

Rabbit 12. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
25.2.41	2197	210	-	-	-	-	-
26.2.41	2239	172	-	-	-	-	-
27.2.41	2253	181	-	-	Blank = 14*	-	-
28.2.41	2211	180	-	-	-	-	-
1.3.41	2168	191	-	-	-	-	-
2.3.41	-	11	-	-	-	-	-
3.3.41	2183	232	-	-	-	-	-
4.3.41	2211	130	-	-	-	-	-
5.3.41	2126	124	-	-	-	-	-
6.3.41	2154	72	-	-	-	-	1.0 g. per kg. (4.2 cc.)
7.3.41	2211	50	-	-	-	-	1.0 g. per kg. (4.4 cc).
8.3.41	2211	54	-	-	-	-	2 x 1.0 g. per kg. (8.8 cc.)
9.3.41	-	40	-	-	-	-	-
10.3.41	2211	174	2.0	3.5	-	-	1.0 g. per kg. (4.4 cc.)
11.3.41	2267	68	5.8	4.0	330	215	1.5 g. per kg. (6.8 cc.)
12.3.41	2211	66	2.3	1.5	798	518	1.5 g. per kg. (6.4 cc.)
13.3.41	2239	67	1.8	1.2	413	267	1.5 g. per kg. (6.6 cc.)
14.3.41	2267	75	2.0	1.5	985	728	1.5 g. per kg. (6.8 cc.)
15.3.41	2211	102	1.2	1.2	1040	1047	1.5 g. per kg. (6.4 cc.)

* Blank has been deducted from total, but not from percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
16.3.41	-	67	0.7	0.5	98	56	2.0 g. per kg. (8.8 cc.)
17.3.41	2239	131	0.2	0.3	58	58	2.0 g. per kg. (8.8 cc.)
18.3.41	2211	120	-	-	20	7	2.0 g. per kg. (8.8 cc.)
19.3.41	2211	138	-	-	-	-	2.0 g. per kg. (8.8 cc.)
20.3.41	2267	92	-	-	-	-	2.0 g. per kg. (9.0 cc.)
21.3.41	2295	125	-	-	-	-	2.5 g. per kg. (11.2 cc.)
22.3.41	2267	138	-	-	-	-	-
23.3.41	-	116	-	-	-	-	-
24.3.41	2041	93	-	-	-	-	-
25.3.41	1984	260	-	-	-	-	-
26.3.41	2041	153	-	-	-	-	-
24.4.41	DIED.						

SUGAR TOLERANCE CURVE:

CONSECUTIVE METHOD.

...te.	Blood Sugar in mg. per cent.								
	Fasting.	5min.	28min.	35min.	58min.	65 min.	88min.	95min.	118min.
...3.41*	105	499	282	556	360	520	385	454	345
...4.41	101	463	245	494	286	509	247	539	296

* This animal received four half-hourly injections of 5 cc. of a 100 per cent glucose solution instead of 5 cc. of a 20 per cent glucose solution as in Rabbits 7, 9, 10 and 11.

Rabbit 13. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
18.3.41	2126	159	-	-	-	-	-
19.3.41	2069	162	-	-	-	-	-
20.3.41	2069	160	-	-	-	-	-
21.3.41	2097	172	-	-	-	-	-
22.3.41	2041	112	-	-	-	-	-
23.3.41	-	131	-	-	Blank = 28*	-	-
24.3.41	2183	114	-	-	-	-	-
25.3.41	2097	295	-	-	-	-	-
26.3.41	2097	112	-	-	-	-	-
27.3.41	2097	115	-	-	-	-	-
28.3.41	2097	145	-	-	-	-	-
29.3.41	2069	162	-	-	-	-	-
30.3.41	-	170	-	-	-	-	-
31.3.41	2041	203	-	-	-	-	-
1.4.41	2041	136	-	-	-	-	-
2.4.41	2012	61	-	-	-	-	-
3.4.41	2041	64	-	-	-	-	-
4.4.41	2041	35	-	-	-	-	-
5.4.41	2069	116	-	-	-	-	-
6.4.41	-	-	-	-	-	-	-
7.4.41	2069	104	-	-	-	-	1.5 g. per kg. (6.3 cc.)
8.4.41	2041	149	-	-	-	-	1.0 g. per kg. (4.6 cc.)
9.4.41	2041	67	-	-	260	155	1.5 g. per kg. (6.0 cc.)
10.4.41	2097	59	-	-	552	309	1.5 g. per kg. (6.3 cc.)

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
11.4.41	2097	78	-	-	20	0	1.5 g. per kg. (6.3 cc.)
12.4.41	2183	123	6.2	7.6	52	30	1.5 g. per kg. (6.6. cc.)
13.4.41	-	112	8.8	9.9	750	809	1.5 g. per kg. (6.6 cc.)
14.4.41	2154	139	9.8	13.6	932	1257	1.5 g. per kg. (6.3 cc.)
15.4.41	2154	187	0.2	0.3	53	47	1.5 g. per kg. (6.3 cc.)
16.4.41	2126	130	0.1	0.1	34	8	1.5 g. per kg. (6.3 cc.)
17.4.41	2154	110	-	-	-	-	1.5 g. per kg. (6.3 cc.)
18.4.41	2183	132	0.2	0.3	-	-	1.5 g. per kg. (6.3 cc.)
19.4.41	2154	260	-	-	-	-	1.5 g. per kg. (6.3cc.)
20.4.41	-	221	-	-	-	-	1.5 g. per kg. (6.3 cc.)
21.4.41	2154	246	-	-	-	-	1.5 g. per kg. (6.3 cc.)
22.4.41	2183	192	-	-	-	-	1.5 g. per kg. (6.3 cc.)
23.4.41	2069	279	-	-	-	-	1.5 g. per kg. (6.3 cc.)
24.4.41	2041	360	-	-	-	-	-
25.4.41	1956	136	-	-	-	-	-
26.4.41	1984	286	-	-	-	-	-
27.4.41	1956	235	-	-	-	-	-
28.4.41	1927	196	-	-	-	-	-
29.4.41	1955	202	-	-	-	-	-
30.4.41	1955	215	-	-	-	-	-
1. 5. 41	1842	253	-	-	-	-	-

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
3.5.41	-	-	-	-		KILLED.	

INSULIN SENSITIVITY.

ate.	Blood Sugar in mg. per cent.									
	Fasting.	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.	60min
.4.41	115	100	80	74	64	-	69 †	78 †	78 †	-
.4.41	131	142 **	145 †	149 **	156 **	-	151 †	149 ††	147	151
.4.41	117	112 **	126 **	112 *	117 **	117 *	117 **	109 **		

* + ½ minute † + 2 minutes

** + 1 minute †† + 3 minutes

Rabbit 14. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
25.4.41	2012	140	-	-	-	-	-
26.4.41	2012	167	-	-	-	-	-
27.4.41	-	115	-	-	Blank. 9*	-	-
28.4.41	1984	155	-	-	-	-	-
29.4.41	1984	148	-	-	-	-	-
30.4.41	1899	37	-	-	-	-	1.5 g. per kg. (6 cc.)
1.5.41	1927	66	-	-	-	-	1.5 g. per kg. (5.7 cc.)
2.5.41	1984	130	0.9	1.1	-	-	1.5 g. per kg. (6 cc.)
3.5.41	1984	203	1.9	3.9	-	-	1.5 g. per kg. (6 cc.)
4.5.41	-	188	5.0	9.4	-	-	1.5 g. per kg. (6 cc.)
5.5.41	1927	110	0.4	0.4	64	61	1.5 g. per kg. (5.8 cc.)
6.5.41	1956	160	-	-	32	37	1.5 g. per kg. (5.8 cc.)
7.5.41	1927	160	4.7	7.5	-	-	1.5 g. per kg. (5.8 cc.)
8.5.41	1927	226	4.4	10.0	-	-	1.5 g. per kg. (5.8 cc.)
9.5.41	1927	115	6.2	7.1	-	-	1.5 g. per kg. (5.8 cc.)
10.5.41	1899	148	0.9	1.3	-	-	1.5 g. per kg. (5.7 cc.)
11.5.41	-	220	-	-	-	-	-
12.5.41	1842	220	-	-	-	-	-
13.5.41	1814	197	-	-	-	-	-
14.5.41	1814	151	-	-	-	-	-

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
15.5.41	1814	228	-	-	-	-	-
16.5.41	1757	156	-	-	-	-	-
17.5.41	1785	84	-	-	-	-	-
18.5.41	-	224	-	-	-	-	-
19.5.41	1757	248	-	-	-	-	-
20.5.41	1757	165	-	-	-	-	-
21.5.41	1757	140	-	-	-	-	-
22.5.41	1757	129	-	-	-	-	-
23.5.41	1729	122	-	-	-	-	-
24.5.41	1757	142	-	-	-	-	-
25.5.41	-	157	-	-	-	-	-
26.5.41	1700	85	-	-	-	-	-
27.5.41	1700	79	-	-	-	-	-
28.5.41	1700	128	-	-	-	-	-
29.5.41	1700	100	-	-	-	-	-
30.5.41	1672	127	-	-	-	-	-
31.5.41	1672	133	-	-	-	-	1.5 g. per kg. (5.1 cc.)
1.6.41	-	62	-	-	-	-	1.5 g. per kg. (5.1 cc.)
2.6.41	1700	170	-	-	-	-	1.5 g. per kg. (5.1 cc.)
3.6.41	1729	142	-	-	-	-	1.5 g. per kg. (5.1 cc.)
4.6.41	1700	103	-	-	-	-	1.5 g. per kg. (5.1 cc.)
5.6.41	1729	204	-	-	-	-	1.5 g. per kg. (5.1 cc.)
6.6.41	1700	121	-	-	-	-	-
7.6.41	1672	132	-	-	-	-	-

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
8.6.41	-	161	-	-	-	-	-
9.6.41	1729	150	-	-	-	-	-
10.6.41	1672	132	-	-	-	KILLED.	

INSULIN SENSITIVITY.

Date.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
.4.41	145	145*	135	122*	103	83 ‡	74	65	73
.5.41	165	168*	156	158	158	154	161	159 †	156
.5.41	87	82†	82	67*	53	51	46	40	37

* 1 minute

† 2 minutes

‡ 3 minutes

Rabbit 15. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
13.5.41	1984	39	-	-	-	-	-
14.5.41	2183	152	-	-	-	-	-
15.5.41	2154	135	-	-	-	-	-
16.5.41	2126	198	-	-	Blank = 20*	-	-
17.5.41	2154	140	-	-	-	-	-
18.5.41	-	122	-	-	-	-	-
19.5.41	2154	210	-	-	-	-	1.5 g. per kg. (6 cc.)
20.5.41	2239	80	-	-	-	-	1.5 g. per kg. (6.6 cc.)
21.5.41	2211	62	-	-	-	-	1.5 g. per kg. (6.6 cc.)
22.5.41	2211	27	-	-	78	16	1.5.g. per kg. (6.6 cc.)
23.5.41	2183	59	-	-	190	100	1.5 g. per kg. (6.6 cc.)
24.5.41	2126	80	0.3	0.2	148	118	1.5 g. per kg. (6.3cc.)
25.5.41	-	97	0.6	0.6	238	212	1.5 g. per kg. (6.3 cc.)
26.5.41	2097	72	1.9	1.4	249	165	1.5 g. per kg. (6.3 cc.)
27.5.41	2069	68	3.3	2.3	195	119	1.5 g. per kg. (6.3 cc.)
28.5.41	2154	103	1.1	1.1	32	12	1.5 g. per kg. (6.0 cc.)
29.5.41	2097	87	0.9	0.8	-	-	1.5 g. per kg. (6.3 cc.)
30.5.41	2097	90	-	-	-	DIED.	

* Blank has been deducted from total, but not percentage ketones.

Rabbit 15.

INSULIN SENSITIVITY.

Date.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
4.5.41	151	145*	128	101*	96	98	101	109	115
6.5.41	183	183*	183	183	171	165	172	194	194
9.5.41	187	178†	174	176	183	185	190 †	183 ††	189

* + 1 minute

† + 2 minutes

†† + 3 minutes.

Rabbit 17. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
25.6.41	1814	170	-	-	-	-	-
26.6.41	1785	135	-	-	-	-	-
27.6.41	1814	248	-	-	Blank = 20*	-	-
28.6.41	1842	246	-	-	-	-	-
29.6.41	-	160	-	-	-	-	-
30.6.41	1814	280	-	-	-	-	-
1.7.41	1814	175	-	-	-	-	-
2.7.41	1700	162	-	-	-	-	-
3.7.41	1700	180	-	-	-	-	1.5 g. per kg. (5 cc.)
4.7.41	1814	52	-	-	-	-	1.5 g. per kg. (5.4 cc.)
5.7.41	1899	94	-	-	-	-	1.5 g. per kg. (5.6 cc.)
6.7.41	1814	115	0.1	0.1	39	22	1.5 g. per kg. (5.4 cc.)
7.7.41	1643	147	-	-	63	63	1.5 g. per kg. (4.8 cc.)
8.7.41	1558	63	-	-	20	-	-

DIED.

* Blank has been deducted from total, but not percentage ketones.

Rabbit 18. (Female).

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
6.7.41	1814	175	-	-	-	-	-
7.7.41	1899	151	-	-	-	-	-
8.7.41	1927	130	-	-	Blank = 15*	-	-
9.7.41	1814	210	-	-	-	-	-
10.7.41	1814	221	-	-	-	-	-
11.7.41	1927	249	-	-	-	-	-
12.7.41	1871	266	-	-	-	-	-
13.7.41	-	310	-	-	-	-	-
14.7.41	1899	182	-	-	-	-	-
15.7.41	1984	308	-	-	-	-	-
16.7.41	1956	170	-	-	-	-	1.5 g. per kg. (5.6 cc.)
17.7.41	2012	187	-	-	-	-	1.5 g. per kg. (6 cc.)
18.7.41	1984	222	-	-	-	-	1.5 g. per kg. (5.9 cc.)
19.7.41	1984	253	-	-	-	-	1.5 g. per kg. (5.6 cc.)
20.7.41	-	174	-	-	134	207	-
21.7.41	1927	338	-	-	-	-	1.5 g. per kg. (5.7 cc.)
22.7.41	2012	265	-	-	-	-	1.5 g. per kg. (5.9 cc.)
23.7.41	2012	316	0.1	0.4	-	-	1.5 g. per kg. (5.9 cc.)
24.7.41	2012	296	0.7	2.0	-	-	1.5 g. per kg. (5.9 cc.)
25.7.41	2041	118	-	-	-	-	1.5 g. per kg. (5.9 cc.)
26.7.41	2012	282	1.5	4.2	-	-	1.5 g. per kg. (5.9 cc.)

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
27.7.41	-	159	1.8	2.9	-	-	1.5 g. per kg. (5.9 cc.)
28.7.41	2041	280	4.4	12.3	-	-	1.5 g. per kg. (6.0 cc.)
29.7.41	1984	147	0.8	1.2	-	-	1.5 g. per kg. (5.9 cc.)
30.7.41	2041	119	-	-	-	-	1.5 g. per kg. (6.0 cc.)
31.7.41	1984	172	-	-	-	-	-
1.8.41	1984	297	-	-	-	-	-
2.8.41	1984	112	-	-	-	-	-
3.8.41	1984	355	-	-	-	-	-
4.8.41	1984	222	-	-	-	DIED.	

INSULIN SENSITIVITY.

ate.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
.7.41	133	136	110 †	101	85	73	58	46	47 ††
5.7.41	205	203 **	196 *	172	156	140 †	136 *	126	120
8.7.41	245	237 *	230	233	226	224	212	212	212

* + 1 minute

† + 2 minutes

** + 3minutes.

†† + 4 minutes

Rabbit 20. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
3.8.41	1814	148	-	-	-	-	-
4.8.41	1785	313	-	-	-	-	-
5.8.41	1814	115	-	-	-	-	-
6.8.41	1757	200	-	-	-	-	-
7.8.41	1757	204	-	-	-	-	-
8.8.41	1530	133	-	-	-	-	-
9.8.41	1643	62	-	-	-	-	1.5 g. per kg. (4.8 cc.)
10.8.41	-	40	-	-	-	-	1.5 g. per kg. (4.8 cc.)
11.8.41	1785	100	-	-	-	-	1.5 g. per kg. (5.4 cc.)
12.8.41	1757	263	-	-	-	-	1.5 g. per kg. (5.2 cc.)
13.8.41	1643	79	-	-	-	-	1.5 g. per kg. (4.8 cc.)
14.8.41	1587	41	-	-	-	-	1.5 g. per kg. (4.8 cc.)
15 .8.41	1530	8	-	-	-	-	1.5 g. per kg. (4.5 cc.)
16.8.41	1587	59	-	-	-	-	1.5 g. per kg. (4.8 cc.)
17.8.41	-	115	-	-	-	-	1.5 g. per kg. (4.8 cc.)
18.8.41	1530	200	-	-	-	-	1.5 g. per kg. (4.5 cc.)
19.8.41	1473	295	-	-	-	-	-
20.8.41	1473	91	-	-	-	-	-
21.8.41	1417	143	-	-	-	-	-
22.8.41	1360	87	-	-	-	KILLED.	

Rabbit 21. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
23.9.41	1984	149	-	-	-	-	-
24.9.41	1984	94	-	-	-	-	-
25.9.41	2041	178	-	-	-	-	-
26.9.41	1984	151	-	-	-	-	-
27.9.41	1984	123	-	-	-	-	-
28.9.41	-	62	-	-	-	-	-
29.9.41	1927	230	-	-	-	-	-
30.9.41	1956	83	-	-	-	-	-
1.10.41	2126	120	-	-	-	-	-
2.10.41	2183	194	-	-	-	-	1.5 g. per kg. (6.8 cc.)
3.10.41	2154	68	-	-	-	-	1.5 g. per kg. (6.3 cc.)
4.10.41	2097	98	-	-	-	-	1.5 g. per kg. (6.2 cc.)
5.10.41	-	159	-	-	-	-	1.5 g. per kg. (6.2 cc.)
6.10.41	2041	233	-	-	-	-	1.5 g. per kg. (6.0 cc.)
7.10.41	2097	73	-	-	-	-	1.5 g. per kg. (6.2 cc.)
8.10.41	2041	129	-	-	-	-	1.5 g. per kg. (6.0 cc.)
9.10.41	2154	125	0.7	0.9	-	-	1.5 g. per kg. (6.0 cc.)
10.10.41	2211	179	4.4	7.9	-	-	1.5 g. per kg. (6.6 cc.)
11.10.41	2154	187	2.8	5.1	-	-	1.5 g. per kg. (6.0 cc.)
12.10.41	-	199	0.1	0.2	-	-	1.5 g. per kg. (6.0 cc.)
13.10.41	2211	164	1.1	1.8	-	-	1.5 g. per kg. (6.2 cc.)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
14.10.41	2239	269	0.6	1.7	-	-	1.5 g. per kg. (6.6 cc.)
15.10.41	2267	209	1.6	3.3	-	-	1.5 g. per kg. (6.6 cc.)
16.10.41	2239	240	0.2	0.5	-	-	1.5 g. per kg. (6.6 cc.)
17.10.41	2154	235	-	-	-	-	-
18.10.41	2126	140	-	-	-	-	-
19.10.41	-	112	-	-	-	-	-
20.10.41	1927	295	-	-	-	-	-
21.10.41	1842	255	-	-	-	-	-
22.10.41	1757	89	-	-	-	KILLED.	

INSULIN SENSITIVITY.

Date	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
26.8.41	127	119*	108*	94	81	69	63	69	80
10.10.41	154	147*	136*	122	121	115*	110	115	119
21.10.41	112	109*	103	96	83	74	67	56	51

* + 1 minute.

Rabbit 22. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
14.10.41	2211	158	-	-	-	-	-
15.10.41	2097	205	-	-	-	-	-
16.10.41	2154	244	-	-	-	-	-
17.10.41	2211	186	-	-	-	-	-
18.10.41	2211	166	-	-	Blank= 20*	-	-
19.10.41	-	112	-	-	-	-	-
20.10.41	2211	115	-	-	-	-	-
21.10.41	2154	179	-	-	-	-	-
22.10.41	2211	82	-	-	-	-	-
23.10.41	2267	98	-	-	-	-	1.5 g. per kg. (6.8 cc.)
24.10.41	2183	130	-	-	-	-	1.5 g. per kg. (6.4 cc.)
25.10.41	2183	21	-	-	-	-	1.5 g. per kg. (6.4 cc.)
26.10.41	-	13	-	-	-	-	1.5 g. per kg. (6. 4 cc.)
27.10.41	2211	93	-	-	-	-	1.5 g. per kg. (6.6 cc.)
28.10.41	2211	57	0.06	0.03	-	-	1.5 g. per kg. (6.6 cc.)
29.10.41	2239	108	1.3	1.4	-	-	1.5 g. per kg. (6.6 cc.)
30.10.41	2154	62	1.4	0.9	-	-	1.5 g. per kg. (6.3 cc.)
31.10.41	2154	112	4.7	5.3	-	-	1.5 g. per kg. (6.3 cc.)
1.11.41	2154	171	6.2	10.6	166	250	1.5 g. per kg. (6.3 cc.)
2.11.41	-	285	6.6	18.7	105	242	1.5 g. per kg. (6.3 cc.)

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
3.11.41	2097	282	8.0	22.6	65	127	1.5 g. per kg. (6.2 cc.)
4.11.41	2097	237	6.7	15.8	65	107	1.5 g. per kg. (6.2 cc.)
5.11.41	2183	171	7.2	12.2	-	-	1.5 g. per kg. (6.3 cc.)
6.11.41	2154	271	3.3	9.0	-	-	1.5 g. per kg. (6.3 cc.)
7.11.41	2211	170	2.4	4.1	-	-	1.5 g. per kg. (6.6. cc.)
8.11.41	2154	226	1.3	2.9	-	-	1.5 g. per kg. (6.3 cc.)
9.11.41	-	310	-	-	-	-	1.5 g. per kg. (6.3 cc.)
10.11.41	1927	124	-	-	-	-	-
11.11.41	2012	127	-	-	-	-	-
12.11.41	1927	120	-	-	-	-	-
13.11.41	1984	92	-	-	-	-	-
14.11.41	2041	194	-	-	-	-	-
15.11.41	2041	170	-	-	-	-	-
16.11.41	-	109	-	-	-	-	-
17.11.41	2012	230	-	-	-	-	-
18.11.41	2041	99	-	-	-	-	-

<u>KILLED.</u>

Rabbit 22.

INSULIN SENSITIVITY.

ate.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
0.10.41	119	115*	109	98*	83**	80	78	89	92
0.10.41	160	165*	160	151	142	136	135	133	138
.11.41	163	180*	171	163*	160	142*	140*	133	149
.11.41	162	162*	156	147†	145*	140	147	160	178
2.11.41	138	105**	100	94*	74*	69	62	71	78*

* + 1 minute † + 3 minutes

** + 2 minutes

Rabbit 24. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
14.2.42	1927	119	-	-	-	-	-
15.2.42	-	84	-	-	-	-	-
16.2.42	1956	64	-	-	Blank = 22*	-	-
17.2.42	1927	56	-	-	-	-	1.5 g. per kg. (5.7 cc.)
18.2.42	1871	48	-	-	-	-	1.5 g. per kg. (5.6 cc.)
19.2.42	1927	-	-	-	-	-	1.5 g. per kg. (5.7 cc.)
20.2.42	1899	54	-	-	-	-	1.5 g. per kg. (5.7 cc.)
21.2.42	1899	100	0.3	0.3	173	151	1.5 g. per kg. (5.7 cc.)
22.2.42	-	197	0.1	0.2	140	233	1.5 g. per kg. (5.7 cc.)
23.2.42	1871	6	-	-	75	3	1.5 g. per kg. (5.6 cc.)
24.2.42	1871	172	0.3	0.5	-	-	1.5 g. per kg. (5.6 cc.)
25.2.42	1814	50	0.7	0.3	98	38	1.5 g. per kg. (5.6 cc.)
26.2.42	1814	64	0.5	0.3	-	-	1.5 g. per kg. (5.6 cc.)
27.2.42	1814	97	-	-	-	-	-
28.2.42	1814	115	1.4	1.7	-	-	-
1.3.42	-	175	1.1	1.9	-	-	1.5 g. per kg. (5.6 cc.)
2.3.42	1757	78	-	-	-	-	1.5 g. per kg. (5.4 cc.)
3.3.42	1814	95	-	-	-	-	1.5 g. per kg. (5.6 cc.)
4.3.42	1814	98	-	-	-	-	1.5 g. per kg. (5.6 cc.)

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
5.3.42	1814	98	0.5	0.5	-	-	1.5 g. per kg. (5.2 cc.)
6.3.42	1814	126	0.1	0.2	-	-	1.5 g. per kg. (5.6 cc.)
7.3.42	1814	165	1.1	1.8	-	-	1.5 g. per kg. (5.6 cc.)
8.3.42	-	137	2.3	3.2	-	-	1.5 g. per kg. (5.6 cc.)
9.3.42	1814	166	2.5	4.2	-	-	1.1 g. per kg. (3.9 cc)
10.3.42	1814	211	2.6	5.5	-	-	1.5 g. per kg. (5.6 cc.)
11.3.42	1871	115	2.9	3.3	-	-	1.0 g. per kg. (4 cc.)
12.3.42	1814	262	0.8	2.0	-	-	-
13.3.42	1814	153	0.4	0.6	-	-	-
14.3.42	1871	135	0.2	0.3	-	-	-
15.3.42	1814	262	0.1	0.2	-	-	-
16.3.42	1814	161	-	-	-	-	-
17.3.42	1814	199	-	-	-	-	-
18.3.42	1814	131	-	-	-	-	-
19.3.42	1814	59			DIED.		

SUGAR TOLERANCE:

SINGLE METHOD.

Date.	Blood Sugar in mg. per cent.								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
17.2.42	126	298	286	270	250	235 *	214	183 †	156 †
25.2.42	140	311	286	280 *	276	264	260	260	260 *

* + 1 minute † + 2 minutes.

Rabbit 25. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
18.2.42	2041	96	-	-	-	-	-
19.2.42	2012	157	-	-	-	-	-
20.2.42	2041	186	-	-	-	-	-
21.2.42	2041	122	-	-	Blank = 28*	-	-
22.2.42	-	183	-	-	-	-	-
23.2.42	2041	149	-	-	-	-	-
24.2.42	2041	84	-	-	-	-	-
25.2.42	2041	130	-	-	-	-	-
26.2.42	2069	135	-	-	-	-	-
27.2.42	2041	142	-	-	-	-	1.5 g. per kg. (6 cc.)
28.2.42	2012	82	-	-	-	-	1.5 g. per kg. (6 cc.)
1.3.42	-	126	-	-	-	-	1.5 g. per kg. (6 cc.)
2.3.42	1984	-	-	-	-	-	1.5 g. per kg. (6 cc.)
3.3.42	1927	53	-	-	379	186	1.5 g. per kg. (5.7 cc.)
4.3.42	1927	18	-	-	70	8	1.5 g. per kg. (5.7 cc.)
5.3.42	1871	66	0.6	0.4	620	391	1.5 g. per kg. (5.6 cc.)
6.3.42	1814	27	-	-	129	27	1.5 g. per kg. (5.6 cc.)
7.3.42	1814	43	0.7	0.3	143	50	1.5 g. per kg. (5.6 cc.)
8.3.42	-	34	2.6	0.9	110	28	1.5 g. per kg. (5.6 cc.)
9.3.42	1927	70	1.6	1.1	-	-	-

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
10.3.42	1927	74	0.3	0.2	-	-	-
11.3.42	1984	110	0.1	0.1	-	-	-
12.3.42	2012	183	-	-	-	-	-
13.3.42	1927	194	-	-	-	-	-
14.3.42	1984	168	-	-	-	-	-
15.3.42	-	170	-	-	-	-	-
16.3.42	1956	185	-	-	-	-	-
17.3.42	1927	178	-	-	-	-	-
18.3.42	1984	195	-	-	-	-	-
19.3.42	1984	145	-	-	-	-	-
7.4.42				DIED.			

SUGAR TOLERANCE:

SINGLE METHOD.

Date.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
20.2.42	103	235	207	178 **	158 *	138 **	126	114	101 †
7.3.42	140	228	207	201 *	185 *	178	178	183	183

* + 1 minute ** + 3 minutes

† + 2 minutes

Rabbit 26. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
1.4.42	2097	92	-	-	-	-	-
2.4.42	2097	92	-	-	-	-	-
3.4.42	2041	181	-	-	-	-	-
4.4.42	2041	217	-	-	Blank = 50*	-	-
5.4.42	-	98	-	-	-	-	-
6.4.42	2041	103	-	-	-	-	-
7.4.42	1984	150	-	-	-	-	1.5 g. per kg. (6 cc.)
8.4.42	2041	53	2.1	1.1	-	-	1.5 g. per kg. (6 cc.)
9.4.42	2041	44	6.7	2.9	-	-	1.5 g. per kg. (6 cc.)
10.4.42	2012	56	3.8	2.1	-	-	1.5 g. per kg. (6 cc.)
11.4.42	2041	47	3.4	1.6	-	-	1.5 g. per kg. (6 cc.)
12.4.42	-	89	3.5	3.1	820	695	1.5 g. per kg. (6 cc.)
13.4.42	2069	98	3.4	3.3	-	-	1.5 g. per kg. (6 cc.)
14.4.42	2069	54	6.5	3.5	450	216	1.5 g. per kg. (6 cc.)
15.4.42	2041	147	3.0	4.4.	-	-	1.5 g. per kg. (6 cc.)
16.4.42	2154	50	2.3	1.2	-	-	1.5 g. per kg. (6 cc.)
17.4.42	2211	66	0.8	0.6	-	-	1.5 g. per kg. (6.3 cc.)

DIE D.

* Blank has been deducted from total, but not percentage ketones.

Rabbit 26.

SUGAR TOLERANCE:

SINGLE METHOD.

Date.	Blood Sugar in mg. per cent								
	Fasting	5 min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
.4.42	133	282	241	212	190*	169	158	138	124
.4.42	209	311	304	296	284	270	270	270	256††

* + 1 minute. †† + 5 minutes.

Rabbit 28 (Female).

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
23.4.42	2324	59	-	-	-	-	-
24.4.42	2324	142	-	-	Blank = 29 *	-	-
25.4.42	2324	252	-	-	-	-	1.5 g. per kg. (6.7 cc.)
26.4.42	-	64	-	-	-	-	1.5 g. per kg. (6.7 cc.)
27.4.42	2352	150	-	-	-	-	1.5 g. per kg. (7 cc.)
28.4.42	2380	90	-	-	-	-	1.5 g. per kg. (7 cc.)
29.4.42	2380	80	-	-	364	268	1.5 g. per kg. (7 cc.)
30.4.42	2267	110	0.5	0.5	42	14	1.5 g. per kg. (6.7 cc.)
1.5.42	2267	70	0.5	0.4	-	-	1.5 g. per kg. (6.7 cc.)
2.5.42	2267	54	3.4	1.8	115	46	-

DIED.

SUGAR TOLERANCE:

SINGLE METHOD.

Date.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
24.4.42	158	272	256	230	224	203	194	163	151
1.5.42	222	321	296	272	262	245	243	239	239

* Blank has been deducted from the total, but not percentage ketones.

Rabbit 29. (Female).

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
27.4.42	1984	160	-	-	-	-	-
28.4.42	2041	147	-	-	Blank = 41*	-	-
29.4.42	2012	83	-	-	-	-	-
30.4.42	2012	125	-	-	-	-	-
1.5.42	2041	175	-	-	-	-	-
2.5.42	2012	126	-	-	-	-	1.5 g. per kg. (6 cc.)
3.5.42	-	28	-	-	-	-	1.5 g. per kg. (6 cc.)
4.5.42	1984	96	-	-	-	-	1.5 g. per kg. (6 cc.)
5.5.42	1956	56	-	-	-	-	1.5 g. per kg. (5.7 cc.)
6.5.42	2041	50	-	-	-	-	1.5 g. per kg. (6 cc.)
7.5.42	2041	57	-	-	-	-	1.5 g. per kg. (6 cc.)
8.5.42	2012	75	2.7	2.0	-	-	1.5 g. per kg. (6 cc.)
9.5.42	1984	94	0.1	0.1	-	-	1.5 g. per kg. (6 cc.)
10.5.42	-	89	1.8	1.6	-	-	1.5 g. per kg. (6 cc.)
11.5.42	1956	22	-	-	-	-	1.5 g. per kg. (5.7 cc.)
12.5.42	1956	34	-	-	667	213	1.5 g. per kg. (5.7 cc.)
13.5.42	1899	26	-	-	390	91	1.5 g. per kg. (5.7 cc.)
14.5.42	1899	248	-	-	-	-	-
15.5.42	1927	225	-	-	-	-	-

* Blank has been deducted from the total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
16.5.42	1927	212	-	-	-	-	-
17.5.42	-	143	-	-	-	-	-
18.5.42	1956	103	-	-	-	-	-
19.5.42	1956	101	-	-	-	-	-
20.5.42	1956	178	-	-	-	-	-
21.5.42	1984	165	-	-	-	-	-
22.5.42	1970	140	-	-	-	-	-
23.5.42	1927	124	-	-	-	-	-
24.5.42	-	128	-	-	-	-	-
25.5.42	1956	110	-	-	-	-	-
26.5.42	1984	89	-	-	-	-	-
27.5.42	1984	163	-	-	-	-	-
28.5.42	1984	73	-	-	-	-	-
29.5.42	1984	115	-	-	-	-	-
30.5.42	1956	171	-	-	-	-	-
31.5.42	-	-	-	-	-	-	-
1.6.42	1984	-	-	-	-	-	-
20.6.42		KILLED.					

SUGAR TOLERANCE:

SINGLE METHOD.

Date.	Blood Sugar in mg. per cent								
	Fasting	5 min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
29.4.42	133	249	239	212	194 *	176	162	145	140
1.6.42	121	230 *	215 *	201	174 *	153 †	140 *	119 *	109 *

* + 1 minute. † + 2 minutes.

Rabbit 30. (Female)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
4.5.42	1927	121	-	-	-	-	-
5.5.42	1984	91	-	-	-	-	-
6.5.42	1927	148	-	-	-	-	-
7.5.42	1984	56	-	-	Blank - 42*	-	-
8.5.42	1984	142	-	-	-	-	-
9.5.42	1984	95	-	-	-	-	-
10.5.42	-	170	-	-	-	-	-
11.5.42	2012	36	-	-	-	-	-
12.5.42	1984	47	-	-	-	-	-
13.5.42	1927	79	-	-	-	-	-
14.5.42	1927	169	-	-	-	-	1.5 g. per kg. (5.7 cc.)
15.5.42	1927	114	-	-	-	-	1.5 g.per kg. (5.7 cc.)
16.5.42	1956	92	-	-	-	-	1.5 g. per kg. (5.7 cc.)
17.5.42	-	34	-	-	-	-	1.5 g. per kg. (5.7 cc.)
18.5.42	1899	120	-	-	-	-	1.5 g. per kg. (5.7 cc.)
19.5.42	1984	25	1.7	0.4	-	-	1.5 g. per kg. (6 cc.)
20.5.42	1871	108	3.7	4.0	-	-	1.5 g. per kg. (5.6 cc.)
21.5.42	1899	31	1.0	0.3	75	10	1.5 g. per kg. (5.7 cc.)
22.5.42	1927	39	2.8	1.1	81	15	1.5 g. per kg. (5.7 cc.)
23.5.42	1956	48	1.1	0.5	-	-	1.5 g. per kg. (5.8 cc.)

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
24.5.42	-	70	0.9	0.7	-	-	-
25.5.42	1927	67	0.6	0.4	-	DIED.	

SUGAR TOLERANCE:

SINGLE METHOD.

Date.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
[illegible].5.42	114	249	231	212	187	171	140	119	107
[illegible].5.42	168	311	294	276	262	254	242	235	230

Rabbit 31. (Female).

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
19.5.42	2239	34	-	-	-	-	-
20.5.42	2239	143	-	-	-	-	-
21.5.42	2211	114	-	-	-	-	-
22.5.42	2211	80	-	-	Blank = 45*	-	-
23.5.42	2211	90	-	-	-	-	-
24.5.42	-	90	-	-	-	-	-
25.5.42	2126	116	-	-	-	-	1.5 g. per kg. (6.3 cc.)
26.5.42	2154	62	-	-	-	-	1.5 g. per kg. (6.3 cc.)
27.5.42	2154	160	1.3	2.1	-	-	1.5 g. per kg. (6.3 cc.)
28.5.42	2097	72	0.2	0.1	-	-	1.5 g. per kg. (6.3 cc.)
29.5.42	2097	55	2.5	1.4	-	-	1.5 g. per kg. (6.3 cc.)
30.5.42	2097	69	1.1	0.7	-	-	1.5 g. per kg. (6.3 cc.)
31.5.42	-	155	4.4	6.9	-	-	1.5 g. per kg. (6.3 cc.)
1.6.42	2211	196	7.0	13.7	189	282	1.5 g. per kg. (6.6 cc.)
2.6.42	2197	292	6.4	18.8	334	843	1.5 g. per kg. (6.6 cc.)
3.6.42	2211	288	7.3	21.1	465	1210	1.5 g. per kg. (6.6 cc.)
4.6.42	2154	330	9.9	32.7	562	1706	-
5.6.42	2239	114	4.4	5.0	-	-	-
6.6.42	2183	200	-	-	-	-	-
7.6.42	-	150	-	-	-	-	-
8.6.42	2126	180	-	-	-	-	-

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
9.6.42	2168	178	-	-	-	-	-
10.6.42	2069	200	-	-	-	-	-
11.6.42	2083	129	-	-	-	-	-
12.6.42	2069	87	-	-	-	-	-
13.6.42	2097	123	-	-	-	-	-
13.7.42	**KILLED.**						

SUGAR TOLERANCE:

SINGLE METHOD.

Date.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
6.5.42	160	295	270	252	226	218 *	194	158	128
8.5.42	203	338	306	278	258	239	235	230 *	225
8.7.42	130	296	252	212	184 †	162 *	148	119 *	99

* + 1 minute. † + 2 minutes.

Rabbit 32. (Male)

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
29.5.42	2211	150	-	-	-	-	-
30.5.42	2183	145	-	-	-	-	-
31.5.42	-	313	-	-	-	-	-
1.6.42	2239	136	-	-	Blank - 34*	-	-
2.6.42	2267	210	-	-	-	-	-
3.6.42	2295	208	-	-	-	-	-
4.6.42	2295	293	-	-	-	-	-
5.6.42	2352	271	-	-	-	-	-
6.6.42	2352	253	-	-	-	-	1.5 g. per kg. (6.9 cc.)
7.6.42	-	126	-	-	-	-	1.5 g. per kg. (6.9 cc.)
8.6.42	2380	140	0.5	0.7	-	-	1.5 g. per kg. (7.1 cc.)
9.6.42	2366	283	0.1	0.4	-	-	1.5 g. per kg. (6.9 cc.)
10.6.42	2352	240	0.5	1.1	-	-	1.5 g. per kg. (6.9 cc.)
11.6.42	2437	263	4.9	12.9	-	-	1.5 g. per kg. (7.2 cc.)
12.6.42	2437	257	4.9	12.6	-	-	1.5 g. per kg. (7.2 cc.)
13.6.42	2437	282	7.8	21.9	-	-	1.5 g. per kg. (7.2 cc.)
14.6.42	-	285	9.7	27.5	-	-	1.5 g. per kg. (7.2 cc.)
15.6.42	2380	234	2.5	5.9	-	-	1.5 g. per kg. (7 cc.)
16.6.42	2395	190	0.3	0.5	-	-	-
17.6.42	2380	265	-	-	-	-	-

* Blank has been deducted from total, but not percentage ketones.

Date.	Body Weight in g.	Urine Volume in cc.	Urine Sugar in g.%	Total Urine Sugar per 24 hr. in g.	Urine Ketones in mg.%	Total Urine Ketones per 24 hr. in mg.	A.P.E.
18.6.42	2352	225	-	-	-	-	-
19.6.42	2395	152	-	-	-	-	-
20.6.42	2395	119	-	-	-	-	-
21.6.42	-	210	-	-	-	-	-
22.6.42	2437	99	-	-	-	-	-
23.6.42	2437	218	-	-	-	-	-
24.6.42	2437	165	-	-	-	-	-
25.6.42	2437	120	-	-	-	-	-

13.7.42 DIED.

SUGAR TOLERANCE:

SINGLE METHOD.

te.	Blood Sugar in mg. per cent								
	Fasting	5min.	10min.	15min.	20min.	25min.	30min.	40min.	50min.
6.42	117	260	256	218	187	176	160	142	128
6.42	135	282	260	251*	226	211	203	194	185
6.42	96	192*	176	158	133†	124	121	105	96*

* + 1 minute. † + 2 minutes.

Quantitative Estimation

of

Pancreatic Islet Tissue.

No.	%age Islet Tissue		Wt. Pancreas in g.	Wt. Islet Tissue in g.	No. Islets counted	Av. Area one Islet in sq. cm.		Av. Vol. one Islet c.μ.	Av. Wt. one Islet in γ	Total No. of Islets.
1.	1.37 1.46 1.86	1.56	2.71	0.04	27 97 67	0.68 0.87 0.68	0.74	0.261	0.274	146,000
2.	3.21 5.27 1.97	3.48	2.34	0.08	147 189 44	0.79 1.06 0.72	0.86	0.324	0.340	235,000
3.	1.01 1.13 1.11	1.08	5.69	0.06	31 25 34	1.10 1.38 1.17	1.22	0.541	0.568	108,000
4.	2.26 1.34 3.84	2.48	2.76	0.07	152 90 270	0.70 0.46 0.88	0.68	0.241	0.253	277,000
5.	1.65 1.66 2.41	1.91	2.93	0.06	80 137 138	0.62 0.49 0.79	0.63	0.207	0.217	277,000
6.	1.61 1.15 2.15	1.64	3.12	0.05	125 54 156	0.53 0.61 0.73	0.62	0.207	0.217	230,000
7.	1.01 1.05 1.46	1.17	3.06	0.04	53 132 35	0.68 1.00 0.90	0.86	0.324	0.340	118,000
8.	2.29 0.73 2.46	1.83	3.70	0.07	49 20 80	1.00 0.94 1.15	1.03	0.424	0.445	152,000

Rabbit	ISLETS Wt. Sheet in g.	Wt. Islets in g.	Area Sheet in sq.cm.	Area Islets in sq.cm.	ACINAR TISSUE Wt. Sheets in g.	Wt. Acinar Tissue in g.	Area Sheets in sq.cm.	Area Acinar Tissue in sq.cm
9. H.	3.97	0.81	530.3	108.2	32.1 +13C	14.8 +13C	4242.4 + 13C	8849.9
B.	3.99	1.18	"	156.8	76.3 + 3C	43.5 + 3C	10075.7 + 3C	6354.8
T.	3.97	1.44	"	192.4	52.3 + 3C	32.2 + 3C	6893.9 + 3C	4854.9
10.H.	3.98	0.51	"	68.0	32.4	18.0	4242.4	2356.9
B.	4.08	0.70	"	91.0	40.3	25.0	5303.0	3289.7
T.	3.97	0.40	"	53.4	36.3	22.8	4772.7	2997.7
11.H.	3.98	0.46	"	61.3	44.3 +16C	24.7 +16C	5833.3 + 16C	6508.4
B.	4.03	0.40	"	52.6	24.2 + 9C	13.4 +9C	3181.8 + 9C	3593.5
T.	4.03	0.69	"	90.8	44.2 + 8C	26.8 + 8C	5833.3 + 8C	5164.9
12.H.	4.06	0.27	"	35.3	24.1 + 3C	14.1 + 3C	3181.8 + 3C	2472.1
B.	4.07	0.40	"	52.1	36.1 + 1C	22.2 + 1C	4772.7 + 1C	3138.5
T.	4.03	1.40	"	184.2	44.4 + 22C	25.3 + 22C	5833.3 + 22C	7778.4
13.H.	3.97	0.48	"	64.1	28.1 +16C	16.0 +16C	3712.1 + 16C	5369.7
B.	4.04	0.21	"	27.6	44.3 +11C	26.3 +11C	5833.3 + 11C	5701.6
T.	4.00	0.66	"	87.5	16.1 + 9C	8.3 +9C	2121.2 + 9C	2925.0
14.H.	4.01	0.66	"	87.3	40.2 + 6C	23.0 + 6C	5303.0 + 6C	4255.1
B.	3.90	0.49	"	66.6	40.2	21.7	5303.0	2862.6
T.	4.09	0.93	"	120.6	44.4 + 3C	26.5 + 3C	5833.3 + 3C	4092.1
15.H.	4.04	0.92	"	120.8	24.2 + 9C	12.7 + 9C	3181.8 + 9C	3501.3
B.	4.03	0.73	"	96.1	28.3 + 4C	16.4 +4C	3712.1 + 4C	2965.2
T.	4.05	1.00	"	130.9	16.2 + 6C	8.6 +6C	2121.2 + 6C	2347.1

.	%age Islet Tissue		Wt. Pan-creas in g.	Wt. Islet Tissue in g.	No. Islets counted	Av. Area one Islet in sq.cm.		Av. Vol. one Islet c.μ.	Av. Wt. one Islet in γ	Total No. of Islets.
	1.22				112	0.97				
	2.47	2.55	2.96	0.08	150	1.05	1.07	0.451	0.474	159,000
	3.96				161	1.20				
.	2.89				60	1.13				
	2.77	2.48	6.20	0.15	70	1.30	1.10	0.480	0.504	305,000
	1.78				61	0.88				
1.	0.94				110	0.56				
	1.46	1.39	3.45	0.05	55	0.96	0.83	0.302	0.317	151,000
	1.76				93	0.98				
2.	1.43				31	1.14				
	1.66	1.82	3.71	0.07	47	1.11	1.21	0.541	0.568	119,000
	2.37				133	1.38				
3.	1.19				72	0.89				
	0.48	1.55	1.86	0.03	60	0.46	0.88	0.348	0.365	79,000
	2.99				68	1.29				
4.	2.05				149	0.59				
	2.33	2.44	2.48	0.06	91	0.73	0.65	0.224	0.235	257,000
	2.95				188	0.64				
5.	3.45				133	0.91				
	3.24	4.09	4.09	0.17	90	1.07	1.05	0.424	0.445	376,000
	5.58				112	1.17				

Rabbit	ISLETS				ACINAR TISSUE			
	Wt. Sheet in g.	Wt. Islets in g.	Area Sheet in sq.cm.	Area Islets in sq.cm.	Wt. Sheets in g.	Wt. Acinar Tissue in g.	Area Sheets in sq.cm.	Area Acinar Tissue in sq.
26. H.	4.06	1.33	530.3	173.7	40.1	25.5	5303.0	3372.2
B.	3.96	0.75	"	100.4	32.1	19.7	4242.4	2603.6
T.	3.98	1.64	"	218.5	40.1	27.9	5303.0	3689.6
28. H.	4.05	0.41	"	53.7	20.1	12.0	2651.5	1583.0
B.	4.06	0.75	"	98.0	32.0 + 3C	20.4 + 3C	4242.4 + 3C	3315.0
T.	3.99	1.33	"	176.8	24.1 +5C	15.3 +5C	3181.8 +5C	3037.5
29. H.	4.06	0.25	"	32.7	20.1	12.1	2651.5	1596.2
B.	3.98	0.16	"	21.3	20.1	13.1	2651.5	1728.1
T.	3.95	0.49	"	65.8	24.2 +4C	16.0 + 4C	3181.8 + 4C	2917.7
30. H.	3.96	0.29	"	38.8	20.0	13.4	2651.5	1776.5
B.	4.05	0.44	"	57.6	24.2 +1C	16.5 + 1C	3181.8 + 1C	2372.9
T.	4.08	0.39	"	50.7	28.2	16.6	3712.1	2185.1
31. H.	3.99	0.57	"	75.8	32.3 + 7C	19.0 +7C	4242.4 + 7C	3920.0
B.	4.07	0.62	"	80.8	40.2	25.4	5303.0	3350.7
T.	4.03	0.69	"	90.8	16.1 + 5C	10.5 + 5C	2121.2 + 5C	2400.9
32. H.	3.97	0.76	"	101.5	24.2 + 8C	12.6 +8C	3181.8 + 8C	3284.6
B.	4.02	0.20	"	26.4	20.1 + 1C	12.9 + 1C	2651.5 + 1C	1905.2
T.	4.04	0.13	"	17.1	16.1	9.0	2121.2	1185.8

	%age Islet Tissue	Wt. Pancreas in g.	Wt. Islet Tissue in g.	No. Islets Counted	Av. Area one Islet. in sq.cm.	Av. Vol. one Islet c.μ.	Av. Wt. one Islet in γ	Total No. of Islets.
.	5.15 3.86 4.98 5.92	5.89	0.29	89 56 121	1.95 1.79 1.85 1.81	1.070	1.123	261,000
.	3.39 2.96 4.06 5.82	3.76	0.15	37 61 104	1.45 1.61 1.59 1.70	0.838	0.880	173,000
.	2.05 1.23 1.85 2.26	4.95	0.09	42 40 79	0.78 0.53 0.71 0.83	0.261	0.274	334,000
0.	2.18 2.43 2.31 2.32	3.03	0.07	28 45 39	1.39 1.28 1.32 1.30	0.643	0.675	104,000
1.	1.93 2.41 2.71 3.78	3.70	0.10	74 69 91	1.02 1.17 1.06 1.00	0.451	0.474	212,000
2.	3.09 1.39 1.97 1.44	1.00	0.02	87 25 19	1.17 1.06 1.04 0.90	0.424	0.445	44,000

Control.	ISLETS				ACINAR TISSUE			
	Wt. Sheet in g.	Wt. Islets in g.	Area Sheet in sq.cm.	Area Islets in sq.cm.	Wt. Sheets in g.	Wt. Acinar Tissue in g.	Area Sheets in sq.cm.	Area Acinar Tissue in sq.c
1. H.	4.04	0.21	530.3	27.6	20.2	13.4	2651.5	1758.9
B.	4.00	0.40	"	53.0	24.1	15.6	3181.8	2059.6
T.	4.01	0.29	"	38.4	24.2	15.2	3181.8	1998.5
2. H.	4.05	0.26	"	34.0	24.1	14.3	3181.8	1887.9
B.	4.05	0.16	"	21.0	20.1	12.5	2651.5	1648.9
T.	4.05	0.41	"	53.7	24.1 + 2C	15.3 + 2C	3181.8 + 2C	2427.0
3. H.	4.07	0.15	"	19.5	20.1	10.7	2651.5	1411.5
B.	4.04	0.22	"	28.9	28.1	18.2	3712.1	2404.2
T.	3.99	0.27	"	35.9	20.2	13.8	2651.5	1811.4
4. H.	4.04	0.26	"	34.2	24.1	15.4	3181.8	2033.2
B.	4.03	0.22	"	29.0	24.1	15.7	3181.8	2072.8
T.	4.05	0.15	"	19.6	28.1	18.6	3712.1	2457.1
5. H.	4.09	0.18	"	23.3	20.1	11.5	2651.5	1517.0
B.	4.07	0.07	"	9.1	20.1	14.4	2651.5	1899.6
T.	4.07	0.37	"	48.2	20.1 + 3C	12.5 + 3C	2651.5 + 3C	2259.4
6. H.	4.04	0.19	"	24.9	20.2 + 5C	10.7 + 5C	2651.5 + 5C	2422.0
B.	4.64	0.29	521.6	32.6	18.7 +9C	11.5 +9C	2086.4 + 9C	3114.6
T.	4.68	0.76	"	84.7	23.5 +16C	12.8 +16C	2608.0 + 16C	4676.5
7. H.	4.70	0.77	"	85.5	42.0	29.0	4694.4	3241.4
B.	4.64	0.20	"	22.5	28.2	18.7	3129.6	2075.3
T.	4.73	0.93	"	102.6	37.6 + 5C	23.0 + 5C	4172.8 + 5C	3570.0

%age Islet Tissue		Wt. Pancreas in g.	Wt. Islet Tissue in g.	No. Islets Counted	Av. Area one Islet in sq.cm.		Av. Vol. one Islet c.μ.	Av. Wt. one Islet in γ	Total No. of Islets
1.57				40	0.69				
2.57	2.02	3.10	0.06	44	1.20	0.89	0.348	0.365	172,000
1.92				50	0.77				
1.80				84	0.41				
1.27	1.76	2.43	0.04	54	0.39	0.43	0.122	0.128	334,000
2.21				107	0.50				
1.38				43	0.45				
1.20	1.52	4.07	0.06	62	0.47	0.49	0.147	0.154	402,000
1.98				64	0.56				
1.68				53	0.65				
1.40	1.29	4.65	0.06	40	0.73	0.64	0.207	0.217	276,000
0.80				36	0.54				
1.52				42	0.55				
0.48	1.38	3.57	0.05	17	0.54	0.58	0.175	0.184	268,000
2.13				73	0.66				
1.03				49	0.51				
1.05	1.30	2.40	0.03	61	0.53	0.54	0.160	0.168	186,000
1.81				147	0.58				
2.64				105	0.81				
1.08	2.20	2.80	0.06	41	0.56	0.72	0.261	0.274	225,000
2.87				129	0.80				

Control	ISLETS				ACINAR TISSUE			
	Wt. Sheet in g.	Wt. Islets in g.	Area Sheet in sq.cm.	Area Islets in sq.cm.	Wt. Sheets in g.	Wt. Acinar Tissue in g.	Area Sheets in sq.cm.	Area Acinar Tissue in sq.cm.
8. H.	4.66	0.75	521.6	83.9	28.0 +4C	17.6 +4C	3129.6 +4C	2781.2
B.	4.64	0.51	"	57.3	23.5 +2C	14.0 +2C	2608.0 +2C	1960.7
T.	4.68	1.11	"	123.7	37.7 +6C	24.2 +6C	4172.8 +6C	3899.6
9. H.	4.65	0.69	"	77.4	32.8 +8C	20.5 +8C	3651.2 + 8C	3910.0
B.	4.60	0.27	"	30.6	37.1 +1C	23.9 +1C	4172.8 + 1C	2891.6
T.	4.65	0.18	"	20.2	27.7	17.2	3129.6	1943.3
10.H.	4.60	0.54	"	61.2	32.3	19.5	3651.2	2204.3
B.	4.63	0.20	"	22.5	27.9	16.7	3129.6	1873.3
T.	4.68	0.24	"	26.7	27.9	19.0	3129.6	2130.6

%age Islet Tissue	Wt. Pancreas in g.	Wt. Islet Tissue in g.	No. Islets Counted	Av. Area one Islet in sq.cm.	Av. Vol. one Islet c.μ.	Av. Wt. one Islet in γ	Total No. of Islets.
3.02 2.92 3.04 3.17	3.00	0.09	87 59 137	0.96 0.97 0.94 0.90	0.372	0.390	234,000
1.98 1.06 1.36 1.04	1.95	0.03	106 60 35	0.73 0.51 0.61 0.58	0.190	0.200	133,000
2.78 1.20 1.74 1.25	2.19	0.04	75 44 47	0.82 0.51 0.63 0.57	0.207	0.217	176,000