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Raising Calves on Dry Calf Meals

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IT is a well-established fact that the safest and best way for a dairyman to obtain good dairy cows is to raise them himself. Purchased cows are often inferior in producing ability and are carriers of disease. The good dairyman should see in every heifer calf the possibility of a cow that will not only replace a discarded member of his herd but will also help raise the average production of the herd. The only practical plan for the dairy farmer to follow, if he desires to build up the quality and productive ability of his herd and to keep it free from disease, is to use a good sire and to raise the heifer calves from the best cows.

The ever-increasing demand for milk products, and especially whole milk, has deprived a large number of calves of their natural food. On farms where cream is sold the problem of raising calves is largely solved by feeding skim milk. The dairy farmer selling whole milk is the one most concerned with the problem of economically raising his best heifer calves for replacement.

The use of a dry calf meal seems to meet a specific need as it provides a means whereby the dairyman selling whole milk can raise his own replacements with a minimum of labor and expense. This system also makes it possible to raise calves in herds that are infected with abortion without the usual danger of reinfecting them through milk produced by abortion-infected cows.

TABLE OF CONTENTS

SUMMARY

1. Calves can be successfully weaned from milk at from 30 to 50 days of age, depending upon the size and vigor of the calf. A small amount of milk fed over a longer period is preferable to the same amount fed over a shorter period.

2. Where liquid skim milk is not available calves can be raised on a ration of dry calf meal, hay, and water and be normal in size at 180 days of age.

3. While all three calf meals used in this experiment produced satisfactory growth, O.S.C. calf meals No. 1 and No. 3 gave somewhat better results than calf meal No. 2. The price and availability of the ingredients in the meals should be the factors to determine the calf meal to use.

4. The feed consumed by the average calf of all groups during the 182 days on the experiment and 14 days previous was 154 pounds of whole milk, 87 pounds of reconstituted skim milk, 532 pounds of calf meal, and 567 pounds of oats-and-vetch hay.

5. Using basic prices for the feedstuffs, the total feed cost of raising the average calf to 196 days of age was $18.38.

6. The average daily gain in weight of all calves used in the experiment was 1.24 pounds. This is above the normal for pure-bred Jersey females. Normal skeletal growth was also obtained.

7. The average cost per pound of gain in weight of all calves was 8.2 cents.

8. The use of a dry calf meal in raising calves in comparison to whole milk, skim milk, grain, and hay lowers the feed cost of raising a calf to 180 days of age from $10 to $15. In addition to the saving in feed cost, the system requires less labor.

Raising Calves on Dry Calf Meals

By

I. R. Jones, P. M. Brandt, and F. D. Wilson

INTRODUCTION

It is a generally accepted and well-established fact that calves can be successfully raised on a ration of whole milk, skim milk, grain, hay, and water and be normal at 180 days of age.

Eckles and Gullickson[1] in experimental work found that good calves can be raised on a small amount of milk, which may with safety be dropped from the ration of large vigorous calves at the early age of 50 days.

Mead, Regan and Bartlett[2] in experimental work, the purpose of which was to study the feeds that may be utilized by the calf at the earliest age and to the best advantage, found that calves could be successfully raised on a dry grain mixture when weaned from a milk diet at from 30 to 50 days of age.

Bender and Perry[3] of New Jersey in experimental work where milk feeding was discontinued at 30 days of age found that "Practically all the calves on the dry grain mixture slowed up in weight growth the first ten days and sometimes it lasted for 30 days. Calves can be successfully raised on a dry grain mixture and alfalfa hay fed ad libitum and be 100% normal."

EXPERIMENTAL

PRELIMINARY EXPERIMENTS

In preliminary work at the Oregon Agricultural Experiment Station it was found that calves could be successfully raised on a ration of dry calf meal and hay when milk feeding was discontinued at from 6 to 9 weeks of age. Further studies indicated that with thrifty calves milk feeding could be discontinued as early as 30 days of age. The results from feeding 10 pure-bred calves including 8 Holstein, 1 Ayrshire, and 1 Guernsey, on a ration of dry calf meal and hay after 30 days of age are shown in Tables I and II. The calf meal fed consisted of the following mixture: 150 pounds of ground oats, 100 pounds of yellow corn, 50 pounds of wheat bran, 50 pounds of linseed-oil meal, 50 pounds of soluble blood flour, 5 pounds of salt, and 5 pounds of steamed bone flour.

A survey of Tables I and II shows that the group of ten calves continued to grow when milk feeding was discontinued at the age of 30 days and were, on the average, normal in weight and thrifty in appearance at six months of age. The average feed cost of raising a calf to six months of age, using average prices for feedstuffs, was $18.95. This represents a saving of about $10.00 in feed cost per calf when compared to the cost of raising calves on whole milk, skim milk, grain, and hay up to six months.

TABLE I. GROWTH DATA: PRELIMINARY EXPERIMENT

Calf number and breed	Birth weight	Percentage normal at birth	Weight at 30 days	Percentage normal at 30 days	Weight at 180 days	Percentage normal at 180 days
	Lb.	*%*	*Lb.*	*%*	*Lb.*	*%*
283 Holstein	102	114.44	147	121.55	345	98.85
284 Holstein	80	88.88	123	102.10	315	90.25
285 Holstein	85	94.44	146	121.48	320	91.60
286 Holstein	90	100.00	130	106.38	317	90.83
255B Holstein	107	118.77	157	129.75	400	114.60
262B Holstein	98	108.88	128	105.34	335	98.65
236B Holstein	105	110.50	145	119.15	416	119.19
267B Holstein	95	100.00	139	114.20	345	99.30
649B Guernsey	51	87.69	75	87.56	300	113.20
545 Ayrshire	63	91.30	85	97.70	289	101.04
Average	----	101.49	----	110.52	----	101.75

TABLE II. FEED CONSUMPTION AND COST: PRELIMINARY EXPERIMENT

Calf number and breed	Days received whole milk	Feed*			Feed cost to 180 days
		Whole milk	Calf meal	Oats-vetch hay	
	Days	*Lb.*	*Lb.*	*Lb.*	
283 Holstein	32	398	440	720	$ 20.87
284 Holstein	29	354	450	722	20.22
285 Holstein	30	338	425	717	19.35
286 Holstein	31	338	406	676	18.74
255B Holstein	30	364	540	729	22.36
262B Holstein	30	370	416	630	19.36
236B Holstein	30	374	360	732	18.76
267B Holstein	31	250	415	696	17.27
649B Guernsey	31	200	380	510	14.59
545 Ayrshire	30	314	400	635	17.93
Total	----	3,300	4,232	6,767	$189.45
Average	30.4	330.0	423.2	676.7	18.945

*Feed was charged as follows: $2.00 per hundred for whole milk, $42.34 per ton for calf meal, and $10.00 per ton for oats-and-vetch hay.

In addition to the results with the ten calves reported in Tables I and II, records are available on seven calves which received milk for longer periods. Two Guernsey calves received some milk for 45 and 50 days, two Ayrshires for 45 and 66 days, and three Jerseys for 69, 83, and 85 days. Milk feeding was continued for the periods indicated inasmuch as the calves were valuable pure-bred animals. Also they were not quite so thrifty as the calves reported in Tables I and II at 30 days. The period of milk feeding could probably have been shortened, however, as each of the seven calves was above normal in weight and thriftiness at 180 days of age. The seven calves averaged 110.9 percent normal in weight, or were 10.9 percent above normal, at 180 days. In contrast to this they averaged only 96 percent normal in weight at birth.

Owing to the fact that there seems to be some difficulty in obtaining soluble blood flour of the quality demanded at all times, and that there is a demand for information on the value of skim-milk powder in a calf-meal mixture, it was decided to formulate a calf meal using skim-milk powder in place of the soluble blood flour. Consequently calf meal Number 2 was made up containing 50 pounds of skim-milk powder in place of the 50

pounds of soluble blood flour in calf meal Number 1. This reduced the amount of protein, but it was thought it would be adequate inasmuch as the proteins of milk contain the amino acids essential for growth. Eight calves were raised on calf meal Number 2 with as good results as that obtained with calf meal Number 1. Calf meal Number 2 appeared to be the more palatable of the two, as there was less trouble in getting the calves accustomed to it.

MAIN EXPERIMENT

In order to have a sufficient number of calves of about the same age to check the results of the preliminary investigations, it was decided to raise 30 grade heifer calves purchased from dairymen in the community.

Objects of experiment. The objects of the experiment were:

(1) To determine the earliest age at which calves may be weaned from milk, and the minimum amount of whole milk and skim milk necessary to obtain normal growth.

(2) To determine whether it is possible to raise thrifty calves on a ration of dry calf meal, hay, and water when milk feeding is discontinued at about six weeks of age.

(3) To compare three dry calf meals, varying in the amount and quality of proteins, minerals, and vitamins.

(4) To determine the cost of raising calves to six months of age under this system of feeding compared to the system of raising calves on whole milk, skim milk, grain, and hay.

Plan of experiment. The calves used in the experiment were largely grade Jerseys, although Guernsey characteristics showed up in two and Red Polled characteristics in one. At the time of purchase the calves averaged 14 days of age. Each calf was tagged for identification when purchased. The calves were divided into 3 groups, indicated as Groups A, B, and C, and penned by groups.

Individual records were kept of the amounts of milk and calf meal consumed. Hay was weighed to each group and the average consumption determined. All refused feed was weighed back. Fresh water was kept before the calves at all times.

The weight, height at withers, heart girth, and belly girth were taken shortly after purchase and once each month thereafter. Observations were made daily and any abnormal conditions noted.

Photographs were taken to show the growth, development and changes at different stages in the experiment.

Group A received O.S.C. calf meal Number 1 which consisted of:

Ground oats	150 pounds
Ground yellow corn	100 pounds
Wheat bran	50 pounds
Linseed-oil meal	50 pounds
Soluble blood flour	50 pounds
Steamed bone flour	5 pounds
Salt	5 pounds

Group B received O.S.C. calf meal Number 2 which consisted of:

Ground oats	150 pounds
Ground yellow corn	100 pounds
Wheat bran	50 pounds
Linseed-oil meal	50 pounds
Skim-milk powder (drum process)	50 pounds
Steamed bone flour	5 pounds
Salt	5 pounds

Group C received O.S.C. calf meal Number 3 which consisted of:

Ground oats	120 pounds
Ground yellow corn	80 pounds
Wheat bran	50 pounds
Linseed-oil meal	50 pounds
Skim-milk powder (drum process)	100 pounds
Steamed bone flour	5 pounds
Salt	5 pounds

Analysis of the feeds for crude protein by the department of Agricultural Chemistry gave the following results:

Calf meal Number 1, 22.96 percent
Calf meal Number 2, 16.47 percent
Calf meal Number 3, 19.46 percent
Oats-and-vetch hay, 7.34 percent

Results of experiment. The calves as a whole were fairly thrifty at the start of the experimental period. There was considerable variation in the size and thriftiness of the individual animals. The appearance of the calves shortly after the start of the experiment can be observed from Plates I to VI inclusive. One week after the start of the experiment all the calves in Groups B and C were scouring badly. Only four calves in Group A developed scours. The disturbance was undoubtedly due to the change in the methods of feeding and handling. The fact that the calves in Group A were slightly larger may be one reason why more of the calves in that group did not develop scours. This setback with scours should be considered in comparing the results obtained with the three calf meals.

Growth data. The average growth data on the three groups of calves are given in Tables III, IV, and V and the individual growth data in Charts I to XII inclusive.

TABLE III. GROWTH DATA FOR THE AVERAGE CALF BY GROUPS

Group	Initial age	Final age	Initial weight	Weight at six weeks	Final weight	Initial height	Final height
	Days	*Days*	*Lb.*	*Lb.*	*Lb.*	*Cm.*	*Cm.*
A	14.2	196.2	74.0	96.4	331.0	70.88	99.22
B	14.0	196.0	72.2	88.5	278.5	66.72	93.94
C	13.9	195.9	61.5	82.6	279.7	66.81	95.47

From Table III it will be noted that the average calf of each group was about two weeks of age at the start of the experiment. The average calf of Group A was the largest both in weight and in height at withers at the start of the experiment, at six weeks, and at the end of the experimental

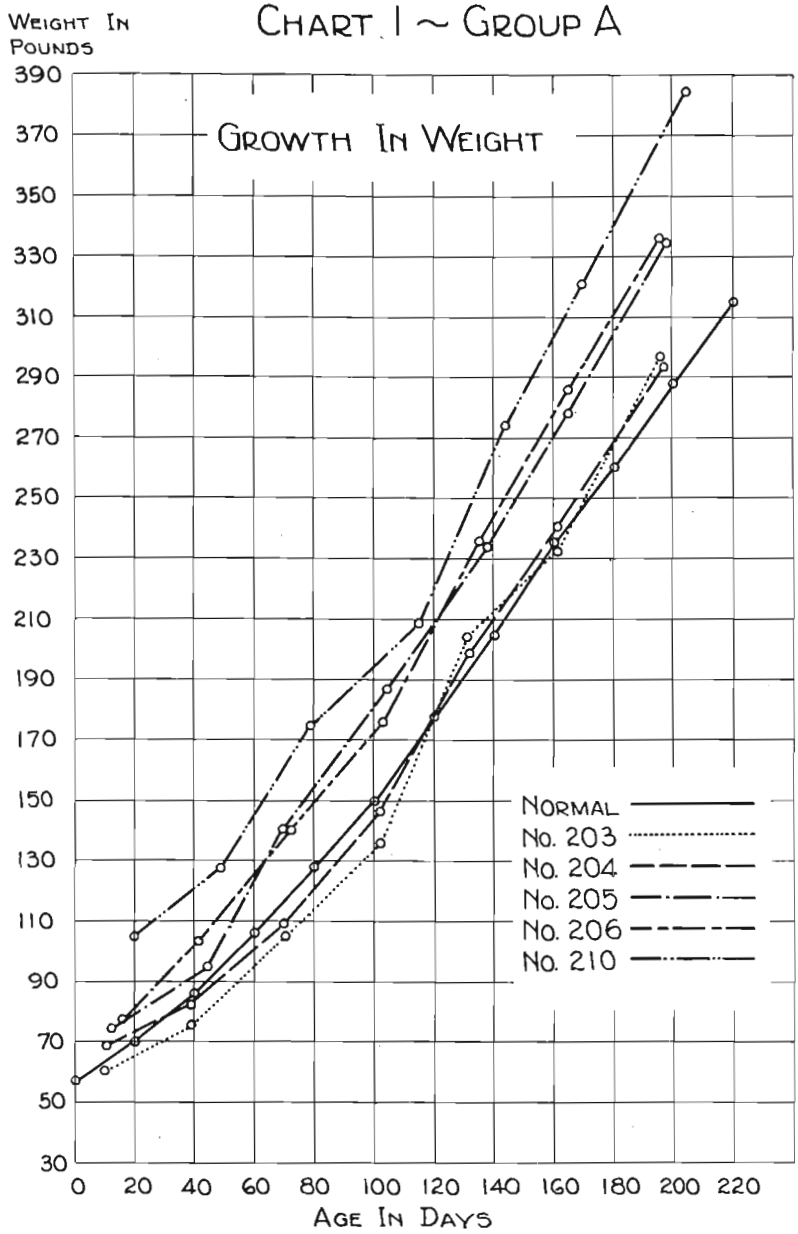
CHART I ~ GROUP A
WEIGHT IN POUNDS
GROWTH IN WEIGHT
390
370
350
330
310
290
270
250
230
210
190
170
150
130
110
90
70
50
30
0 20 40 60 80 100 120 140 160 180 200 220
AGE IN DAYS
NORMAL
No. 203
No. 204
No. 205
No. 206
No. 210

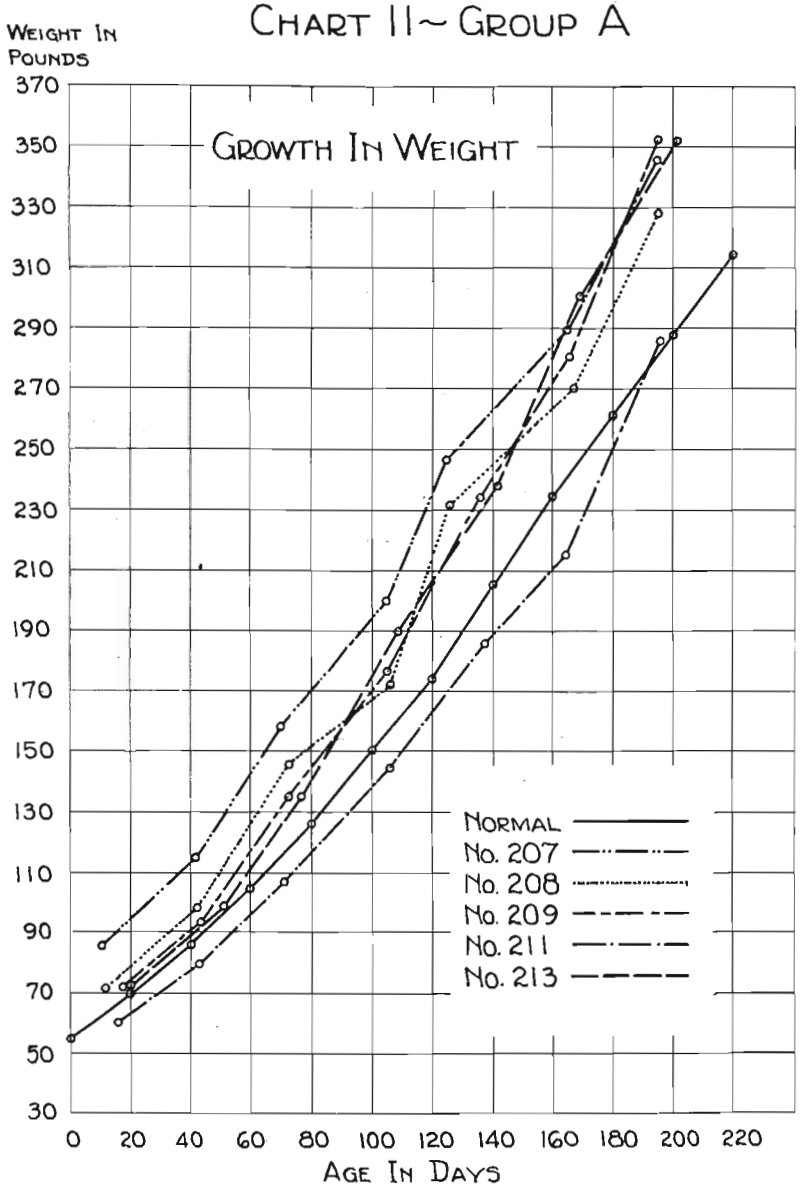
CHART II~GROUP A
WEIGHT IN POUNDS
GROWTH IN WEIGHT
370
350
330
310
290
270
250
230
210
190
170
150
130
110
90
70
50
30
0 20 40 60 80 100 120 140 160 180 200 220
AGE IN DAYS
NORMAL
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No. 208
No. 209
No. 211
No. 213

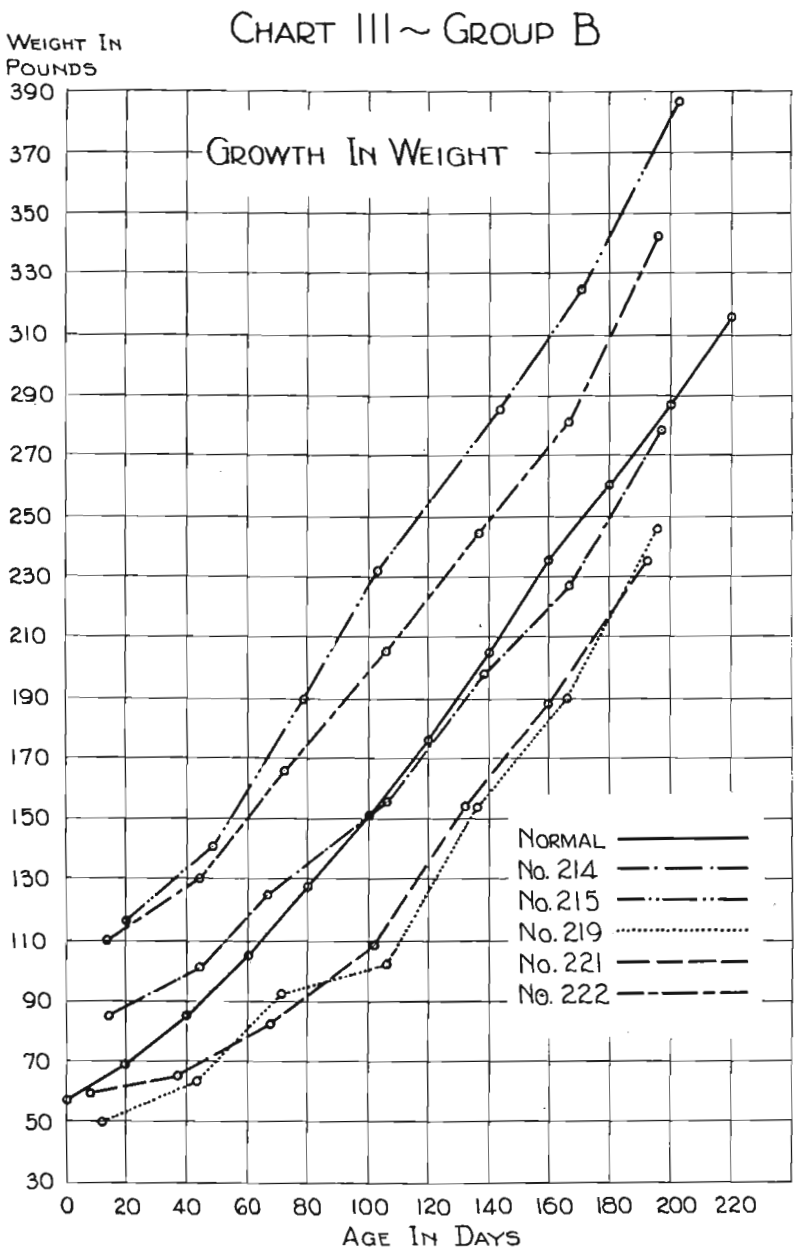
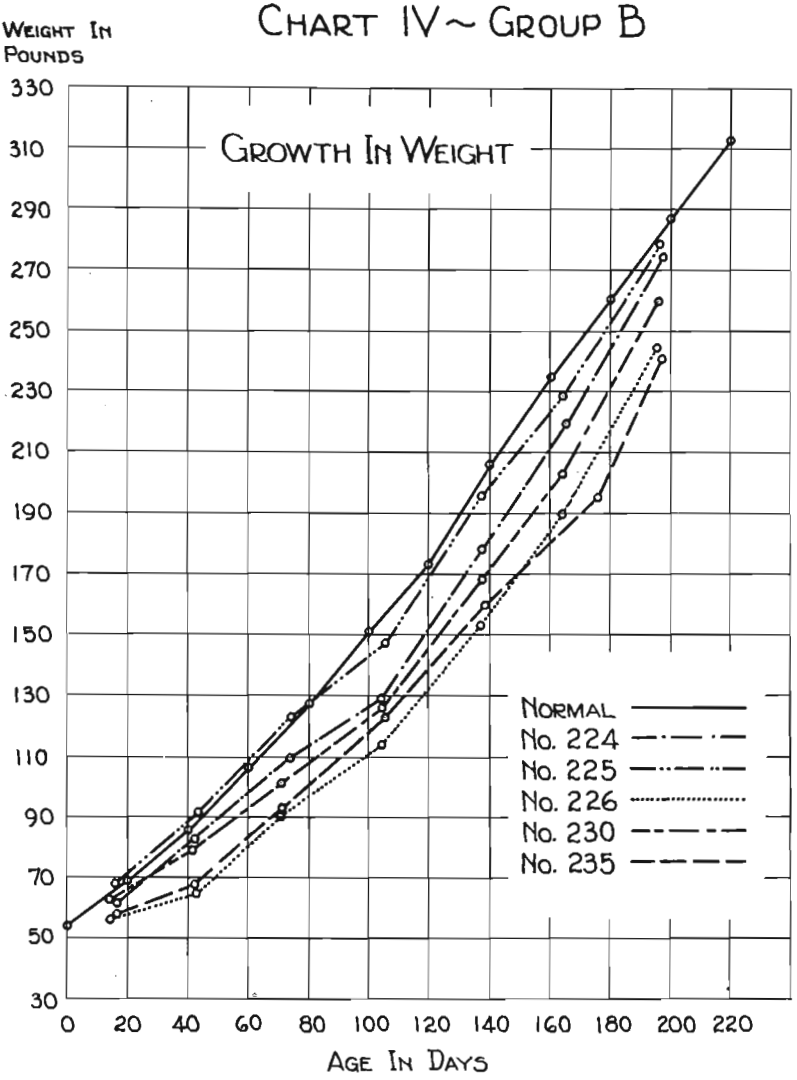


CHART III ~ GROUP B
WEIGHT IN POUNDS
GROWTH IN WEIGHT
390
370
350
330
310
290
270
250
230
210
190
170
150
130
110
90
70
50
30
0 20 40 60 80 100 120 140 160 180 200 220
AGE IN DAYS
NORMAL
No. 214
No. 215
No. 219
No. 221
No. 222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WEIGHT IN POUNDS
GROWTH IN WEIGHT
330
310
290
270
250
230
210
190
170
150
130
110
90
70
50
30
0
20
40
60
80
100
120
140
160
180
200
220
AGE IN DAYS
NORMAL
No. 224
No. 225
No. 226
No. 230
No. 235

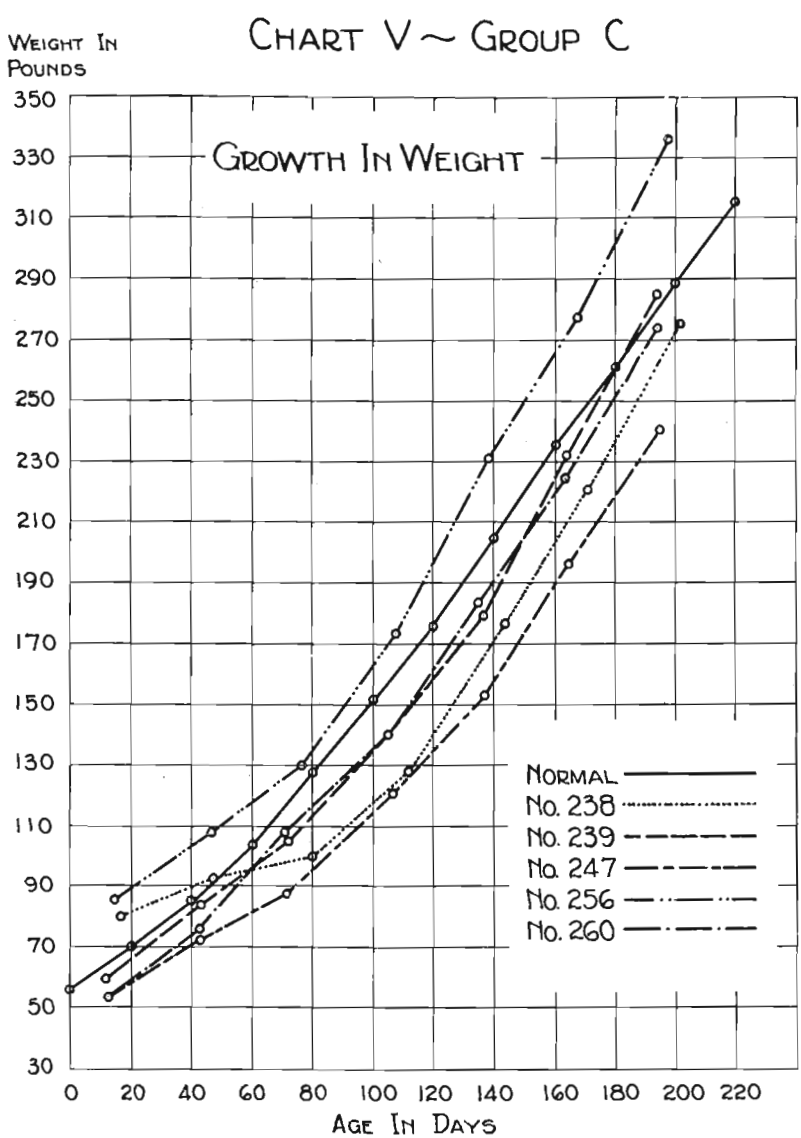
CHART V ~ GROUP C
WEIGHT IN POUNDS
GROWTH IN WEIGHT
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330
310
290
270
250
230
210
190
170
150
130
110
90
70
50
30
0
20
40
60
80
100
120
140
160
180
200
220
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No. 239
No. 247
No. 256
No. 260

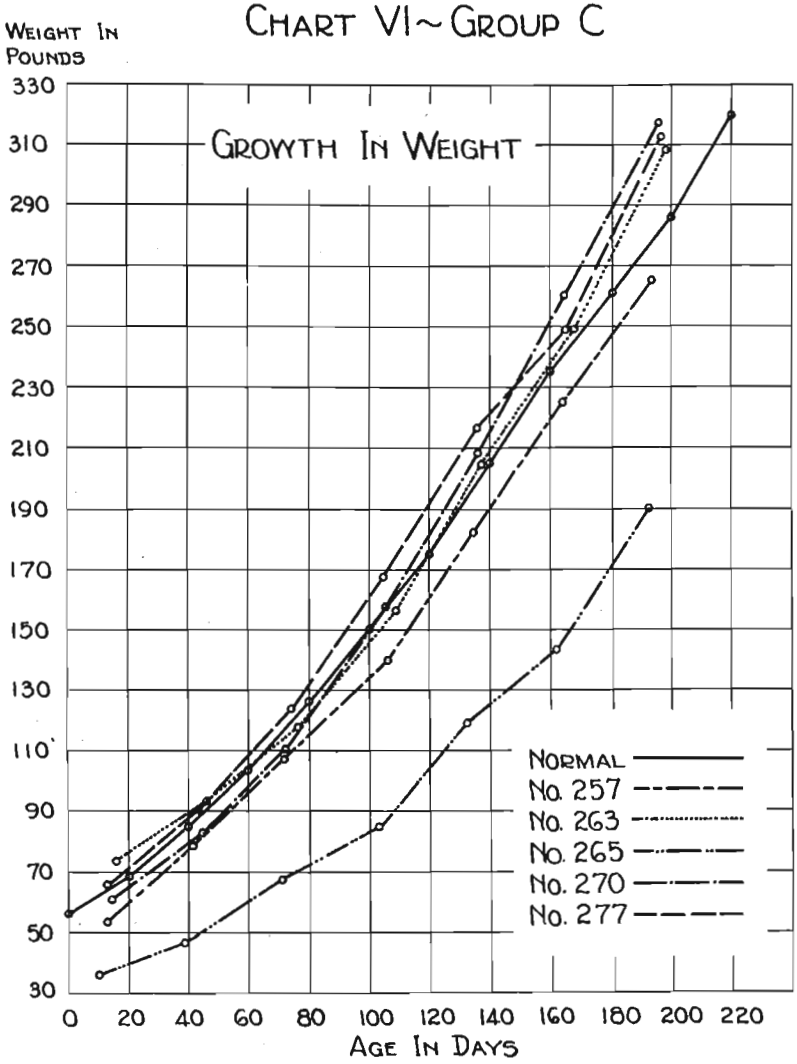
CHART VI~GROUP C
WEIGHT IN POUNDS
GROWTH IN WEIGHT
330
310
290
270
250
230
210
190
170
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110
90
70
50
30
0
20
40
60
80
100
120
140
160
180
200
220
AGE IN DAYS
NORMAL
No. 257
No. 263
No. 265
No. 270
No. 277

period. Group B was second in weight at the start and at six weeks, but in final weight Group C averaged slightly larger than Group B. The average calf in the case of both Group B and Group C was of about the same height at the start of the experiment; at the end of the experiment Group C averaged slightly taller.

Table IV gives the weights of the average calf in each group at each weighing period. The table shows that the average calf in Group A obtained the best start and maintained the leading position throughout the experiment. As previously pointed out, Group A suffered less from scours than Groups B and C shortly after being placed on experiment. This is more clearly demonstrated in Charts I to XII inclusive showing the growth in weight and height of the individual animals.

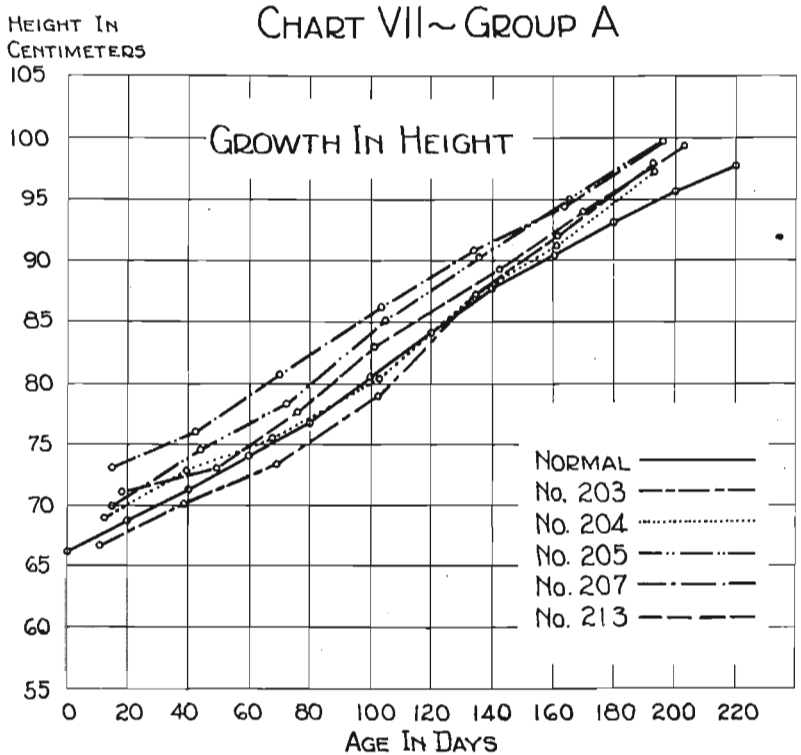


TABLE IV. GROWTH IN WEIGHT OF AVERAGE CALF BY GROUPS PER WEIGHING PERIOD

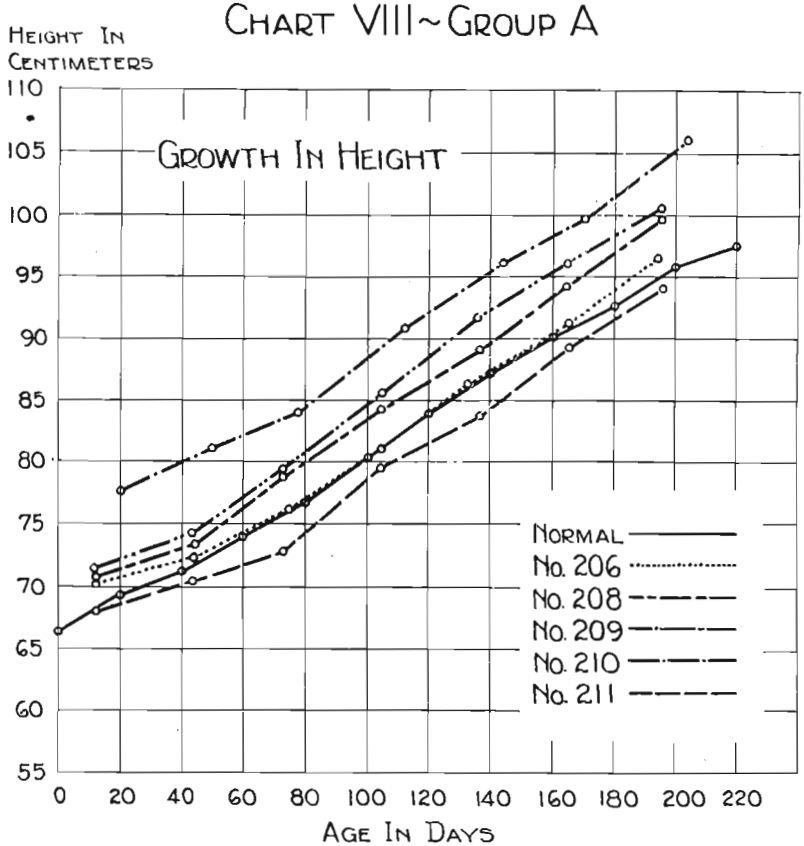
	Age in days						
Group	14	43	73	106	137	165	196
A	74.0	96.4	135.4	173.5	227.6	271.5	331.0
B	72.2	88.5	117.4	144.5	189.3	224.8	278.5
C	61.5	82.6	105.2	140.3	185.0	226.7	279.7

Table V shows the relation of the average calf of the three groups to the normal for Jersey females as given by Eckles.[4]

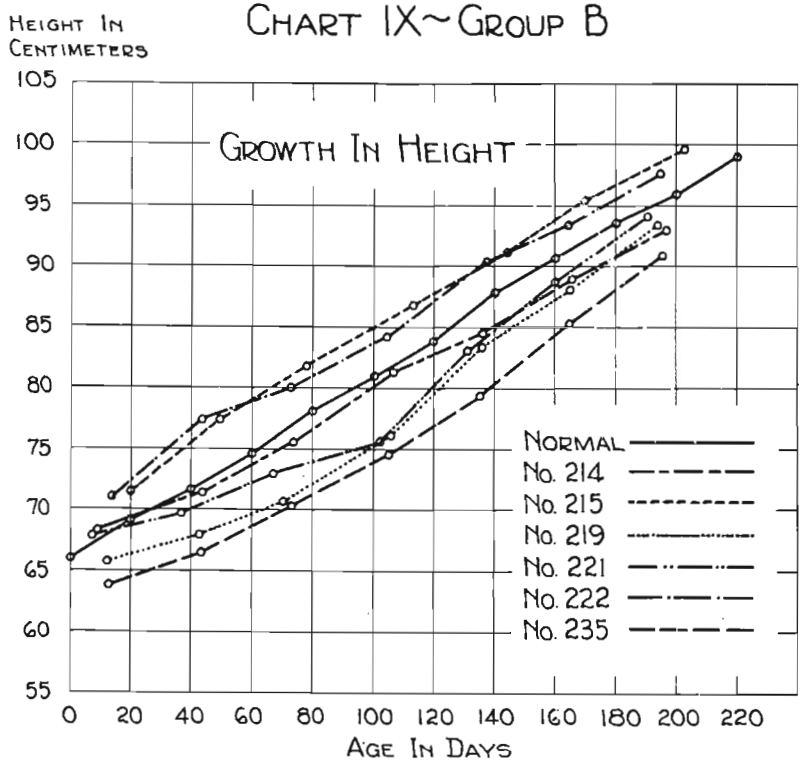
TABLE V. PERCENTAGE NORMAL IN WEIGHT AND HEIGHT FOR THE AVERAGE CALF BY GROUPS

Group	Percentage normal initial weight	Percentage normal weight at 6 weeks	Percentage normal final weight	Percentage normal initial height	Percentage normal final height
A	114.19	108.32	117.21	104.02	104.06
B	111.41	99.41	98.46	98.03	98.09
C	94.90	92.88	99.04	98.16	100.09

A study of Table V shows that in relation to the normal the average calf of Group A was above normal in both weight and height at the start and throughout the experiment. This group tended to increase in weight compared to the normal, whereas they remained in about the same relation to normal height.



The average calf of Group B was considerably lower in relation to the normal weight at 6 weeks than at the start of the experiment at 2 weeks. This group of calves was considerably affected with scours from about the fifteenth to the twenty-fifth day. It is believed that the period from 6 weeks to 196 days is the more accurate period for which to compare the growth of the calves on the three calf meals. From 6 weeks to the end of the experiment the average calf of Group B remained at about the same relation to the normal.

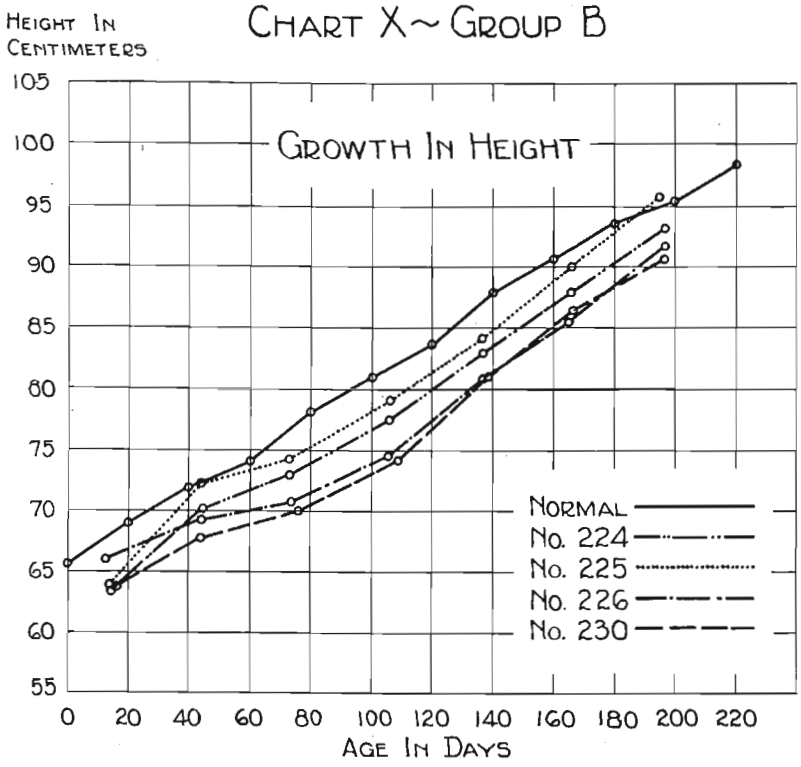


The average calf in Group C was considerably below normal in weight at 14 days and was even more so at 6 weeks but was practically normal at the end of the experiment. This group also made the best skeletal growth, as indicated by its relation to the normal height at the start and at the end of the experiment.

Feed consumption and feed cost data. The amounts of feeds consumed by the average calf in each group and the total feed cost to 196 days is given in Table VI. The feed cost is obtained by applying the basic feed prices as given in Table VII to the actual amounts of feed consumed as shown in Table VI.

TABLE VI. FEEDS CONSUMED BY AND FEED COST OF THE AVERAGE CALF BY GROUPS

Group	Received milk	Whole milk	Reconstituted skim milk	Calf meal	Hay	Total feed cost
	Days	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	
A	46.0	149.3	87.3	520.8	567.8	$17.20
B	48.8	161.5	91.1	523.8	567.6	18.05
C	45.0	152.1	82.7	523.8	567.9	19.90



A study of Table VI shows that the average calf in each group consumed approximately the same amounts of feeds. While milk was fed for 6 to 7 weeks, the amount fed daily was very small averaging from 5 to 5.5 pounds. The average calf consumed 2.67 pounds of calf meal and 2.90 pounds of hay per day for the 196 days. The total feed cost per calf is lowest for Group A and highest for Group C. This is largely due to the variation in the cost of the calf meals as shown in Table VII.

TABLE VII. FEED PRICES UPON WHICH FEED COSTS ARE BASED

Feedstuff	Price per ton	Price per pound
Oats	$26.00	$0.013
Yellow corn	48.00	.024
Wheat bran	22.00	.011
Linseed-oil meal	46.00	.023
Soluble blood flour	90.00	.045
Bone-meal	50.00	.025
Salt	18.00	.009
Skim-milk powder	100.00	.05
Whole milk	.....	.02
Reconstituted skim milk	.....	.005
Oats-and-vetch hay	10.00	.005
O.S.C. Calf meal Number 1	42.34	.021
O.S.C. Calf meal Number 2	43.60	.022
O.S.C. Calf meal Number 3	51.75	.026

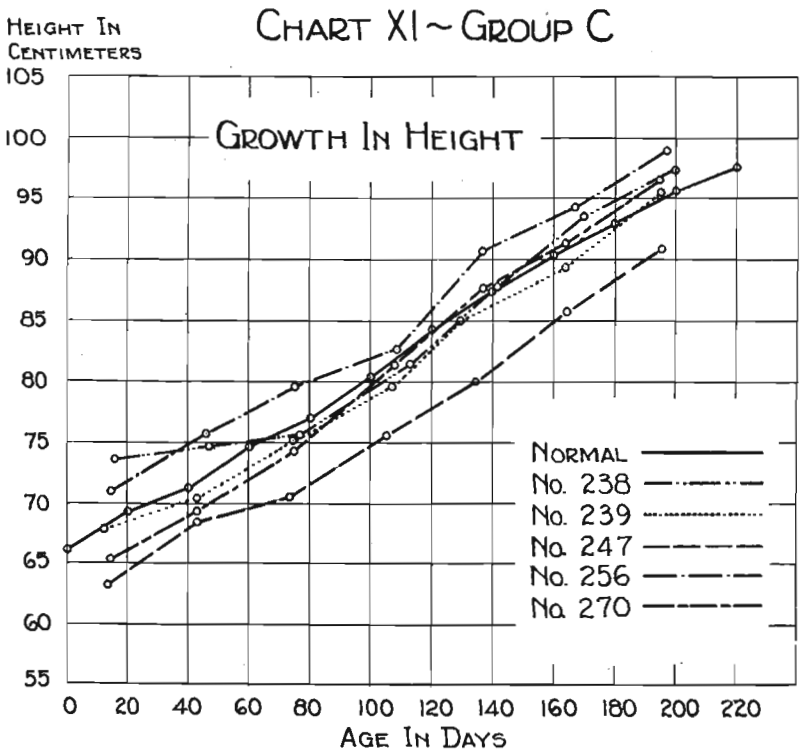
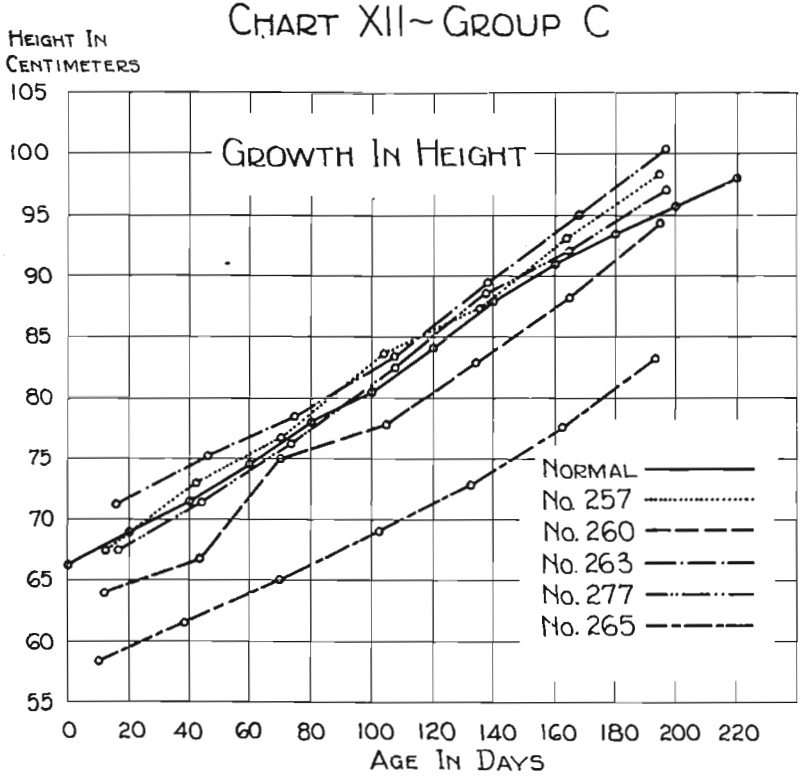


Table VIII gives the total gain and daily gain in height and weight of the average calf in the three groups and the cost per pound of gain. In determining the gains the measurements at 14 and 196 days were used. The cost per pound of gain was determined by applying the total feed cost as given in Table VI to the total gain in weight.

TABLE VIII. TOTAL GAIN AND DAILY GAIN IN HEIGHT AND WEIGHT AND FEED COST PER POUND OF GAIN FOR THE AVERAGE CALF BY GROUPS

Group	Gain in height		Gain in weight		Feed cost per pound of gain
	Total	Daily	Total	Daily	
	Cm.	*Cm.*	*Lb.*	*Lb.*	
A	28.34	.155	257	1.40	$0.067
B	27.32	.149	206.3	1.13	.089
C	28.66	.162	218.2	1.19	.091

A study of Table VIII shows that the average calf of Group A made the greatest gain in weight and the lowest cost per pound of gain. The average calf of Group C was second in the rate of gain but had the highest



cost per pound of gain. This is due to the higher price of the calf meal fed this group. Group C, however, made the greatest gain in height at the withers. This indicates that the inclusion of blood flour in the calf meal stimulated the putting on of flesh and that skim-milk powder produced greater skeletal growth. All of the calf meals used in the experiment produced a satisfactory rate of growth as the average daily gain for the 3

groups of animals was 1.24 pounds per day. This is a greater daily gain than that given by Eckles[4] for the normal growth of pure-bred Jersey females.

The average calf of the three groups received milk for 47 days. During this period it consumed 154 pounds of whole milk and 87 pounds of reconstituted skim milk. The average calf of the 3 groups consumed 523 pounds of calf meal and 567 pounds of oats-and-vetch hay.

The cost of the feed consumed by the average calf of the 3 groups to 196 days of age was $3.08 for whole milk, 46¢ for reconstituted skim milk, $12.00 for calf meal, and $2.84 for hay, making a total feed cost of $18.38. This is an average daily feed cost of 9.38¢. The average feed cost per pound of gain with all the calves was 8.2¢.

Thriftiness, condition, and general appearance of the calves. The general appearance and height of the individual calves at 42, 93, and 182 days after the start of the experiment is shown graphically in Plates I to VI inclusive. The scale of the chart in the background is in inches. Plates I and II show the 10 calves in Group A that received the calf meal containing 12½ percent blood meal; Plates III and IV the 10 calves fed the calf meal containing 12½ percent skim-milk powder; and Plates V and VI the 10 calves receiving the calf meal containing 25 percent skim-milk powder with the percentage of oats and yellow corn reduced.

A study of Plates I to VI inclusive shows that the calves in Group A were the most uniform and thrifty 6 weeks after the start of the experiment. Only 2 calves—Numbers 203 and 211—were appreciably below 30 centimeters in height in contrast to 6 calves—Numbers 219, 221, 224, 226, 230, and 235—in Group B and 6 calves—Numbers 239, 247, 260, 265, and 267—in Group C. It should be noted that one calf, Number 265, in Group C was an especially small calf. While this calf made an average gain in weight of .85 pound per day, this was the lowest daily gain of any of the 30 calves. In Group A, calves Numbers 209, 210, and 213 shown on Plate II made the best gain in weight, averaging 1.54 pounds gain daily. Calf Number 215 made the best gain in weight of the calves in Group B, averaging 1.48 pounds daily. Calves Numbers 256 and 270 made the greatest gain in weight of calves in Group C with 1.40 pounds daily gain.

The calves in Group A varied in gain in height from 31.5 centimeters for Number 203 to 26.1 centimeters for Number 207, thus showing a fairly uniform gain for all the calves. The largest gain in height for the calves in Group B was 31.4 centimeters made by Number 225, shown in Plate IV, and the smallest gain was 24.7 centimeters, made by Number 214, shown on Plate III. In the case of Group C the largest skeletal growth as measured by height at withers was 31.5 centimeters made by two animals—Numbers 257 and 270—and the smallest growth by Number 238 with 23.6 centimeters. The small calf Number 265 gained 25.4 centimeters in height.

The individual calves were rated by three dairy cattle judges on the basis of thrift and condition at the end of the experimental period. The conformation of the animals was disregarded in making the selections for this rating. From the rating it was found that 50 percent of Group A, 30 percent of Group B, and 20 percent of Group C were in the first lot of 10; 20 percent of Group A, 20 percent of Group B, and 60 percent of Group C were in the second lot of 10; and 30 percent of Group A, 50 percent of Group B, and 20 percent of Group C were in the third lot of 10.

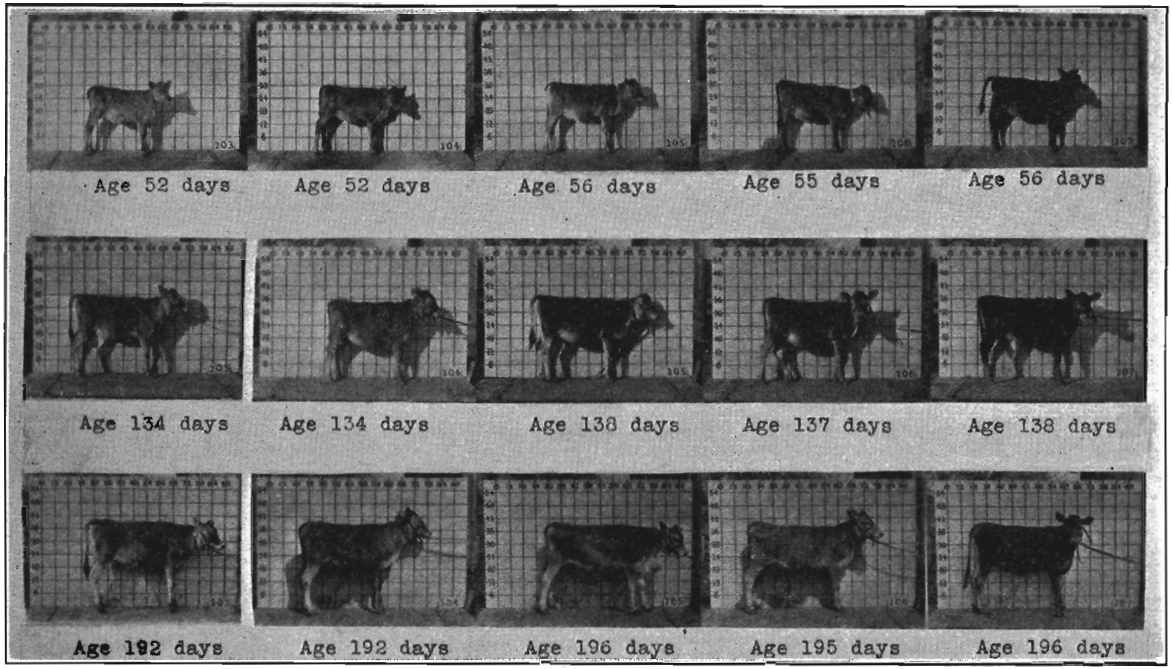


PLATE I. Group A—12½ percent blood meal.

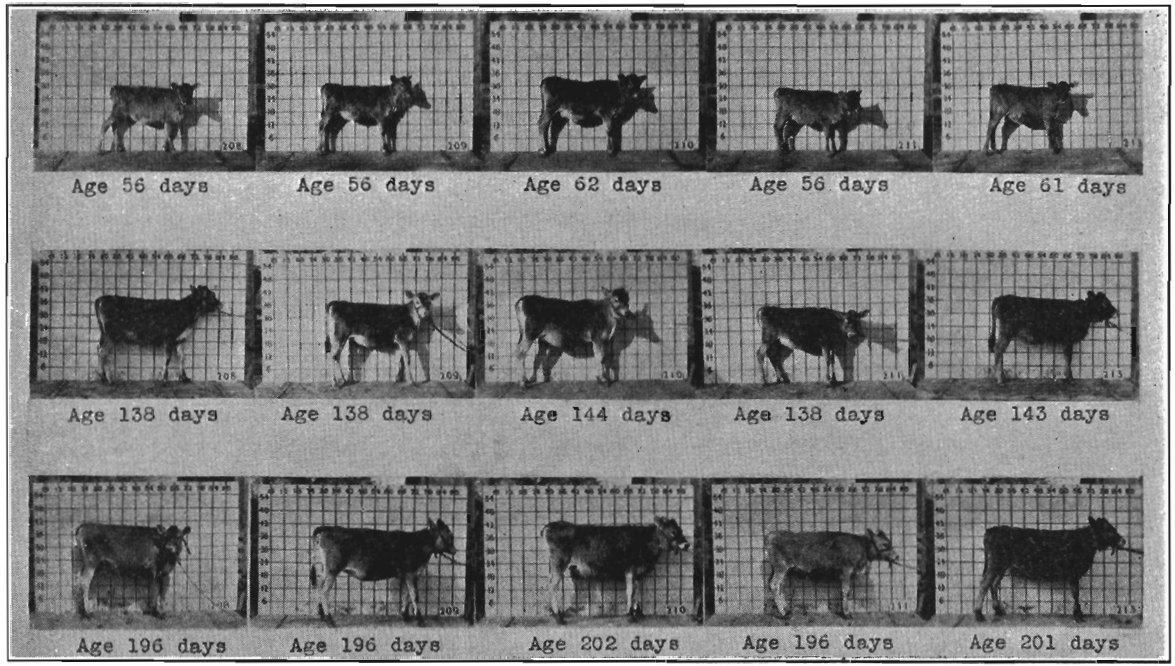


PLATE II. Group A—12½ percent blood meal.

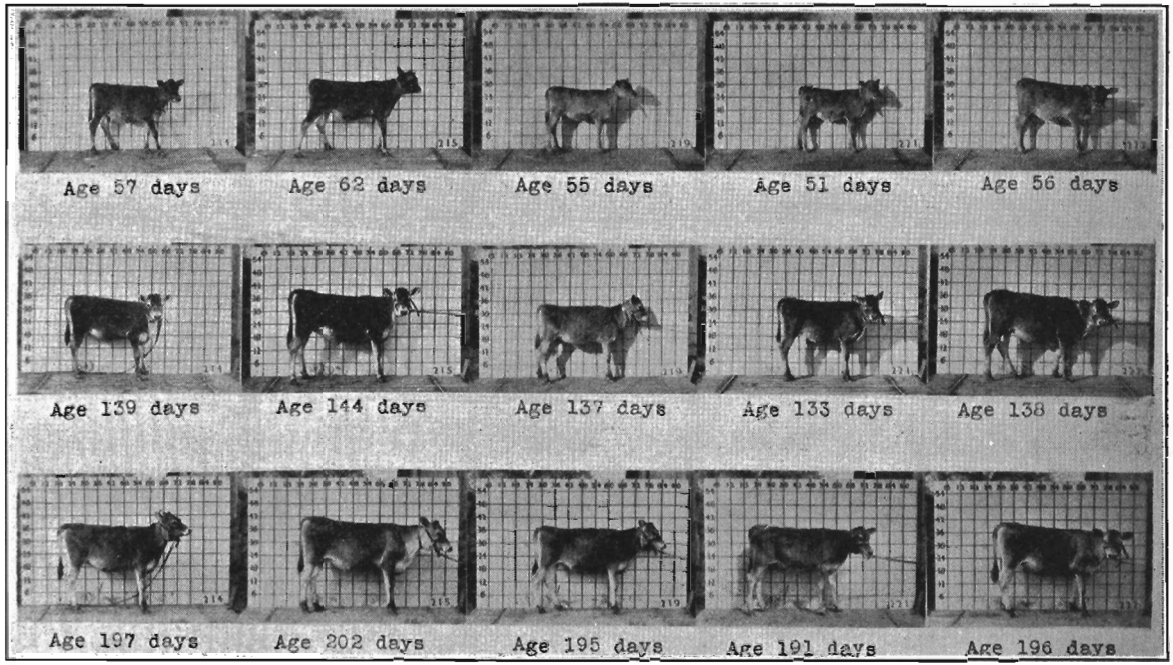


PLATE III. Group B- -12½ percent skim-milk powder.

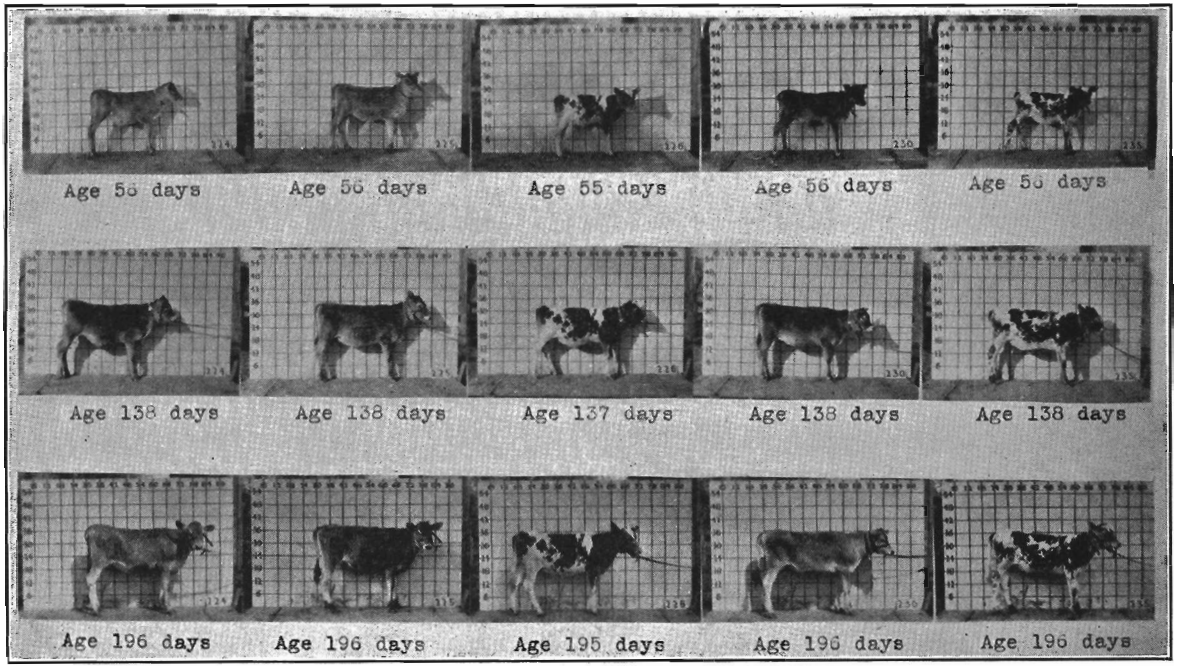


PLATE IV. Group B—12½ percent skim-milk powder.

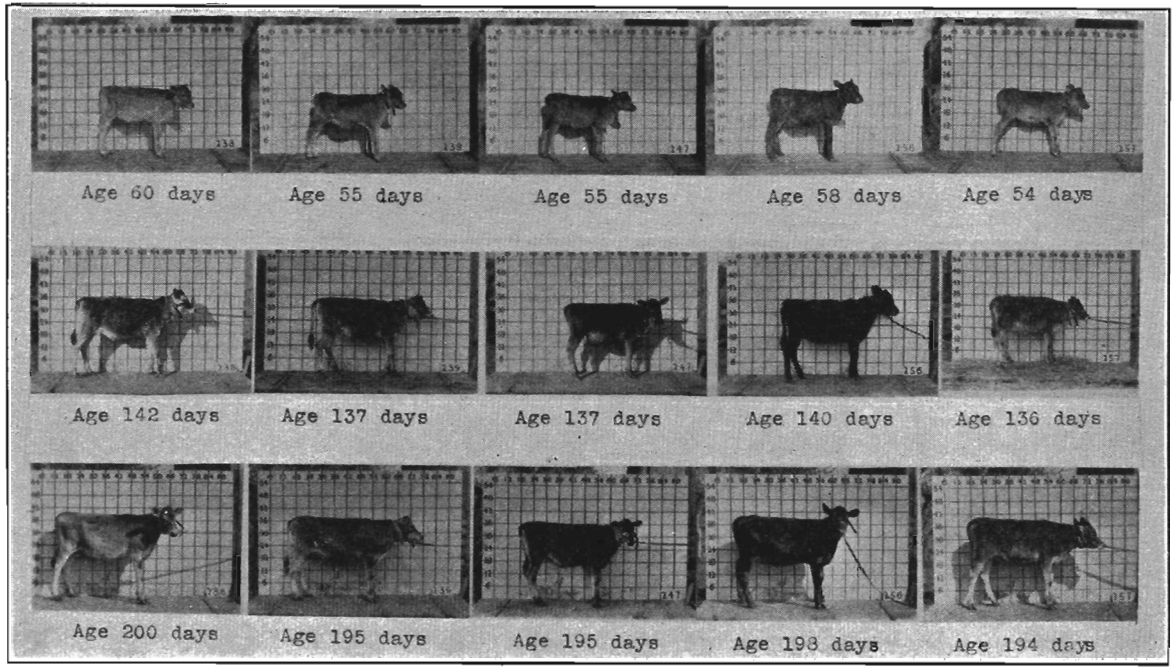


PLATE V. Group C—25 percent skim-milk powder.

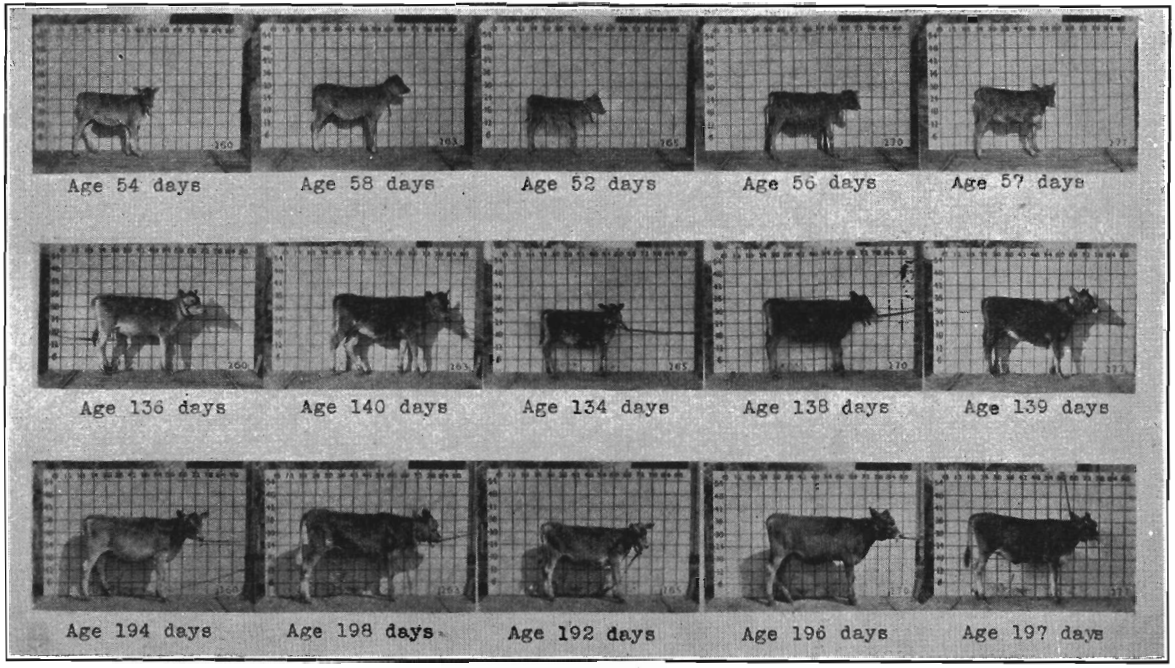


PLATE VI. Group C—25 percent skim-milk powder.

Under this rating and giving each animal in Lot One a value of 100, those in Lot Two a value of 90, and those in Lot Three a value of 80, it was found that Group A ranked first, Group C second, and Group B last.

These judges were unanimous in the opinion that the condition, thriftiness, and general appearance of all three groups of calves were satisfactory when considered from the standpoint of good dairy herd management.

It should be pointed out again that Group A was the most uniform and the largest group of calves at the start of the experiment and did not, as a group, have the setback with scours shortly after being placed on the experiment. It is noteworthy, however, that after the first three weeks on experiment there was no more trouble with scours and the general health of the calves remained exceedingly good.

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