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EXPERIMENTS FEEDING BUTTER-MILK

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The objects of the following feeding trials were to determine the relative values of wash water from the creamery churn, of buttermilk fed alone, and in conjunction with soaked corn, and to determine the effect of corn following a long period of feeding with a very narrow ratio.

TABLE I.

Length of Period.	Lot No.	No. of pigs in Period	Weight at Beginning.	Weight at end of Period.	Gain or Loss.	Weight of Milk drunk.	Weight of Corn.	Nutritive Ratio.
20 Days.	1	3	625	592½	-32½	1988		2.6
" "	2	3	598½	630½	+32	1464½	118	3.7
" "	3	3	795½	835½	+40	1093½	236	5.
" "	4	3	761	842	+81	812½	395	6.

Each lot was given all the diluted milk that it would drink. The total solids of this milk amounted to 4.5 per cent, being about one-half the total solids in ordinary buttermilk, showing that the milk was reduced about one-half its value. Lot two was fed two pounds of shelled corn, soaked, per day and head. Lot three was fed four pounds of shelled corn, soaked, per day and head. Lot four was fed all the corn they would eat which was from six to seven pounds per day and head. The result for lot one shows that the so-called wash water is not a sustaining ration. The pigs losing a little rising one-half pound of live weight per day and head. A part of this loss can be accounted for in stomach contents.

The addition of two pounds of corn to the daily feed of lot two not only prevented loss of weight, but caused a gain of a little rising one-half pound per day and head. The two pounds of corn representing about one pound of flesh and fat. We have no figures showing that it is possible to produce one pound of growth from two pounds of corn. It therefore seems that we must conclude that either the limited amount of corn induced a more complete digestion of the same or that the protein of the milk has a higher nutritive power in the presence of corn.

The increase of two pounds more of corn in the ration of lot three does not produce the same effect as the similar increase in lot two, while the further increase of about two and one-half pounds in the case of lot four again produces a marked effect.

The results shown by the table confirm the proposition that any unnatural increase of water in a ration causes a waste of food energy and that there is nothing gained by mixing the wash water from the churn with the buttermilk. The wash water should be given separately and only to quench thirst. Watering the milk to make it "go around all the calves," or give all the pigs a sip; or throwing wash water into the rich slops of the swill barrel, or adding too much water to soaked or cooked feed, or allowing animals to become intensely thirsty and then to drink large quantities at a single draught, results in the consumption of food energy and consequently a lower rate of gain. The extra water must be warmed, it must be oxidized into urea, which consumes protein, or evaporated at the surface of the skin, or exhaled from the lungs. All these processes consume protein and absorb animal heat. Hence any feeder who forces his animals to take undue quantities of water with their feed, does so at a loss.

TABLE II.

FIRST PERIOD.

Length of Period.	Lot No.	No. of pigs in lot.	Weight at Beginning.	Weight at end of Period.	Lbs. Gain or Loss.	Weight of Milk drunk.	Weight of Corn.	Nutritive Ratio.
21 Days.	1	3	592½	665	+72½	3317½	2.6
" "	2	3	630½	713½	+80	2643½	118	3.3
" "	3	3	835½	912	+76½	887	236	5.4
" "	4	3	842	932	+90	973	413	5.7

SECOND PERIOD.

19 Days.	1	3	665	720½	+55½	3574	2.6
" "	2	3	713½	754	+40½	2500	118	3.2
" "	3	3	912	963	+51	1638	240	4.5
" "	4	3	932	1029¼	+97¼	898	420	6.4

THIRD PERIOD.

19 Days.	1	3	720½	663½	-57¼	3100	2.6
" "	2	3	754	750	-4	2222	110	8.3
" "	3	3	963	1000½	+37½	1218	228	4.6
" "	4	3	1029¼	1099	+69¼	622	399	6.2

The same pigs that were used in feeding trial for table one were used in this table. The same feeds and quantities of feeds were fed except that pure buttermilk was fed instead of churn wash water.

Lot one in period one coming on to the stronger feed of pure buttermilk shows the remarkable change from a loss of $32\frac{1}{2}$ pounds to a gain of $72\frac{1}{2}$ pounds. They continued to gain, though less rapidly, through the next period of 19 days, but in the last period they lost all the gain of the second period. This loss is due to the narrow nutritive ratio, or excessive quantity of albuminoids in their feed. And it brings us to a repetition of the conclusion that even protein when fed for a long time out of proper proportion with carbohydrates loses in nutritive effect and sickens the animal. Lot one in period three had only 8 pounds less of total protein and practically the same fat and carbohydrates as in period one, still the same pigs lost 57 pounds in the one period and gained $72\frac{1}{2}$ pounds in the other.

It is proper to note that the pigs in lot one were a pitiable sight through the entire feeding trial. They wore a sad, melancholy expression, showing that there was something seriously lacking in their feed. We think the lot would have finally died for want of carbohydrate food. The effect on the alimentary canal was peculiar. At times the milk showed a purgative effect and then constipation. These conditions seeming to alternate through the periods. It is noticeable that the larger the quantity of corn fed the smaller was the amount of milk consumed and we think it safe to conclude that the highest results in feeding corn can be obtained when a limited amount of milk is fed. This fact tends to show that our Iowa corn is nearly a balanced ration for hogs and only needs a small addition of protein to bring out the highest nutritive value.

TABLE III.
FIRST PERIOD.

Length of Period.	Lot No.	No. of pigs in lot.	Weight at Beginning.	Weight at end of Period.	Lbs. Gain or Loss.	Weight of Milk drunk.	Weight of Ear Corn.	Nutritive Ratio.
28 Days.	1	3	663½	857	+193½	840	527	4.6

SECOND PERIOD.

20 Days.	1	3	857	995	+ 98	630	325	5.3
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The pigs in the above table are those in tables one and two, which received nothing but buttermilk. In table three they received all the ear corn they would eat and what buttermilk they would drink. The phenomenal gain for food eaten is partly accounted for in stomach contents, but it is largely due to the fact that the system was overloaded with protein, causing an intense hunger for carbohydrates, which being supplied, induced a very rapid rise in flesh and fat formation for a short time. Period two of this table shows that the rapid gain of the first period could not be maintained and that the equilibrium between corn and milk was soon reached, when growth progressed more slowly. The results of this experiment seem to show that a feeding trial should swing pendulum-like from a narrow to a wide nutritive ratio. However, if a true balance of nutrient factors could be formulated there would be no necessity of varying their relative quantities in ration. They also show that short periods in a feeding trial proves nothing as to the permanent value of a nutrient factor.

It may be observed that this feeding trial, benefits but few since buttermilk is so scarce an article of food. It matters not what the source of protein, provided it is in palatable and digestible form. The protein of oil meal or bean meal or pea meal or flesh meal or milk or clover or grass, is practically the same, pound for pound, in nutritive effect.