
UNIVERSITY OF THE STATE OF MISSOURI.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS,

Agricultural Experiment Station

BULLETIN NO. 57.

Raising Calves With Skim Milk.

COLUMBIA, MISSOURI.

April, 1902.

Press of E. W. Stephens, Columbia, Missouri.



University of the State of Missouri.

COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

Agricultural Experiment Station.

BOARD OF CONTROL.

THE CURATORS OF THE UNIVERSITY OF THE STATE OF MISSOURI.

THE EXECUTIVE COMMITTEE OF THE BOARD OF CURATORS.

HON. CAMPBELL WELLS,
Platte City.

HON. G. F. GMELICH,
Boonville.

HON. WALTER WILLIAMS,
Columbia.

ADVISORY COUNCIL.

THE MISSOURI STATE BOARD OF AGRICULTURE.

OFFICERS OF THE STATION.

THE PRESIDENT OF THE UNIVERSITY.

H. J. WATERS, B. S. A.....	DIRECTOR
PAUL SCHWEITZER, Ph. D.....	CHEMIST
J. C. WHITTEN, M. S.....	HORTICULTURIST
J. M. STEDMAN, B. S.....	ENTOMOLOGIST
J. W. CONNAWAY, M. D. C.....	VETERINARIAN
C. H. ECKLES, B. Agr., M. S.....	DAIRY HUSBANDRY
W. L. HOWARD, B. S.....	ASSISTANT IN HORTICULTURE
C. THOM, Ph. D.....	BOTANIST
J. G. BABB, A. B.....	SECRETARY
R. B. PRICE.....	TREASURER
ESTELLE HICKOK.....	CLERK AND STENOGRAPHER

The Bulletins and Reports of the Station will be mailed free to any citizen of Missouri upon request. A cordial invitation is extended to all persons to visit the Station grounds at any time. Address, Director Agricultural Experiment Station, Columbia, Boone County, Missouri.

Raising Calves With Skim Milk.

C. H. ECKLES, Dairy Husbandry.

THE HAND RAISED CALF AN ECONOMIC NECESSITY.

The question of raising calves on skim milk has until very recently been of little interest to the average Missouri farmer. There is no doubt that under conditions of cheap land and abundant feed the farmer has kept cows at a good profit in this State even when a calf for beef purposes was the only income from that cow.

Such conditions still exist in some sections of our country, especially on the ranges of the West. When lands acquire the high value now reached by good Missouri farms, however, the income per acre must be correspondingly increased to meet the new conditions. The farmer comes to the conclusion sooner or later that he can not keep an ordinary cow on such high priced land solely for the calf which she may produce. That is to say, the animal having no value except a beef value is being slowly crowded out.

In certain parts of the State this condition has been felt for some time, and the farmers have decreased the number of cattle kept and are giving more attention to grain raising than formerly. Time will prove this to be a mistake, as every farm must have a certain amount of grass and clover land and must produce a certain amount of manure to maintain its fertility. So also some stock must be kept to utilize the corn

NOTE.—This Bulletin of Information is published in accordance with Section 3 of an Act of the General Assembly of Missouri approved April 17, 1901, establishing the Chair of Dairy Husbandry in the College of Agriculture and appropriating money for the printing and distributing of Bulletins relating to Dairy subjects.

fodder and straw and other coarse fodders so often largely wasted under the present system. The cow or the steer can make the best use of these feeds and will therefore continue to hold a prominent place on the Missouri farm.

Some cow owners will solve the problem of getting more out of their cows by breeding special purpose dairy cows such as the Jerseys, Holsteins, Guernseys, etc. This class of cows well cared for and their product sold to advantage, will give a good profit without paying any attention to the value of the calves not intended to be kept for breeding purposes. Others will solve the problem by breeding a better class of beef cattle or animals which have some value above beef value on account of pedigree and breeding. A larger class will find, however, that it is best to milk their cows, sell the cream and raise the calf on the skim milk. This is being done by thousands of farmers in Missouri and all over the grain and beef raising States, and will be done by thousands more in the near future. By this system the average cow, as found in the State to-day, will give a return in cream sufficient to pay for her feed, the labor in caring for her, and interest on the investment, leaving the calf clear profit. This calf, if well bred, can be grown and fattened with as much success as though raised by its mother. It should and will be a long time before Missouri farmers will be ready to give up the production of beef, especially if it be properly combined with dairying. The man who sells the entire milk, either to a cheese factory or for city trade, has little interest in raising the calf. The owner of special dairy cows has somewhat more, as he must raise cows to replace the discarded members of the herd. The man who sells cream from cows not of special dairy breeds, and has skim milk for feeding, will be most interested in the skim milk calf and can raise it to the best advantage. There is no reason why the steers for the feeders should not all be grown in this manner.

CAN A GOOD CALF BE RAISED ON SKIM MILK?

While many farmers in the State are raising their calves successfully in this way, there are many localities where this practice is virtually unknown and it is not thought possible to raise a good calf except in the natural way. Some have seen unhealthy and undersized calves that have been fed skim milk,



SOME MISSOURI SKIM MILK CALVES.

Raised on Farm Separator Skim Milk by Keyes Farm and Dairy Company, Valley Park, Missouri.

and have considered them as the necessary result of feeding skim milk. Such calves are the unfortunate victims of their owners' ignorance or carelessness. The skim milk calf raised according to modern methods differs little, if any, in size, quality and thrift and value from the same animal when

raised by the cow. The poor results which have so often followed the feeding of skim milk have been due to faulty methods and not because the cream which had been taken out is absolutely indispensable to the normal development of the calf. In truth, the butter fat or cream of the milk is by no means the most valuable part of the milk for the calf. The fat does not go to form growth in a young animal, but to keep up the heat of the body and to supply fat for body tissue. The parts of the milk which furnishes the growth making material are the casein and albumen which are seen as a white curd when milk is sour. From this material is made the muscles and bone, nerves, hair and hoofs, and this remains in the skim milk. The calf fed on skim milk is not generally so fat during the first six months of its life, as the one nursed by the cow. It often has, however, rather a better development of bone and muscle, and the difference between the two can not be seen two weeks after weaning time. It is true the calf requires in addition to skim milk some food which will furnish a reasonable amount of fat to take the place of the fat removed from the milk when it was skimmed. Corn meal has been found to be very satisfactory and is used quite extensively for this purpose. By giving the calf something to properly balance the skim milk, by feeding the milk warm and sweet and not in too large quantities, excellent results may be depended upon. The statement has been made to the writer, by a number of Missouri farmers, that their hand raised calves were not only equal but were really superior to those raised by their neighbors in the natural way. The explanation given for this was that the calf fed by hand was accustomed to eating grain and was not checked in growth in the least by weaning, whereas the one that had been raised by the cow had not learned to eat grain and was materially checked in growth when suddenly deprived

of milk and required to subsist entirely upon grain and coarse fodders.

In an experiment reported by the Kansas Experiment Station, calves raised by their mothers fell off in weight the week following weaning, while the calves raised on skim milk gained 22 pounds each.

WEIGHT OF SKIM MILK CALVES.

The following shows the weights reached by some calves fed on skim milk.

Four steers raised on skim milk at the Kansas Experiment Station * weighed an average of 724 pounds each at twelve months. Nine heifers fed on skim milk averaged 564 pounds at the same age.

At the Iowa Experiment Station † eight skim milk calves averaged 548 pounds at eight months. Another lot of seven averaged 535 pounds at eight months. At the Trans-Mississippi Exposition, Omaha, the best Shorthorn steer on exhibition was raised on skim milk. One of the leading breeders and exhibitors of Red Polled cattle in the United States raises all of his calves on skim milk, including his show herd.

HOW TO RAISE A CALF ON SKIM MILK.

The possibilities of any animal depends largely upon its breeding, and if it is desired to raise a calf which will be especially adapted either for beef or for the dairy, it must first of all be properly bred.

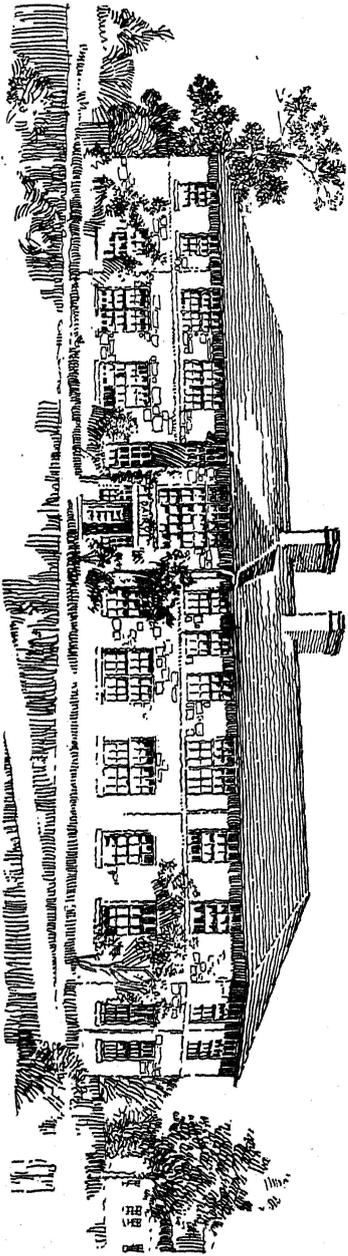
When should the calf be taken from its mother? Some difference of opinion exists as to the best time to begin hand feeding. Some prefer taking the calf away from

*Kansas Experiment Station Bulletin 97.

†Iowa Experiment Station Bulletin 35.

its mother without allowing it to nurse at all. Some let it nurse once, and others allow it to run with the cow three or four days or until the fever is out of the udder and the milk is fit for use in the dairy. It probably makes very little difference as to this point but it is a fact easily established that the earlier the calf is taken from the cow, the easier it will be to teach it to drink. One that has never nursed is easily taught to take the milk from a pail, while one three or four days or a week old is often a difficult subject to teach. If the cow's udder is in good condition when the calf is dropped, it will generally be more satisfactory to take the calf away early. When the udder is caked it is best to leave the calf with her until this condition is removed. One point that must be kept in mind is that at first the milk from the mother should always be given the calf, and not milk from some other cow. The first milk or colostrum given by a cow is especially suited to the requirements of a young calf as it has the property of acting as a physic and stimulating the digestive organs.

Amount of milk to feed. Under natural conditions the calf takes its milk frequently and in small quantities. The calf's stomach at this time is not suited for holding a large amount, and an excessive amount always results in indigestion and scours. For the first two weeks five or six quarts or about ten or twelve pounds per day is all the calf should be allowed to take. Some do not need quite this much. This may be fed in two feeds per day, or better, in three for two or three weeks. As the calf grows older, somewhat more milk can be used, but at no time does it need over sixteen or eighteen pounds or eight or nine quarts per day. Over feeding is undoubtedly one of the most common causes of inferior calves. It is a mistake to think that because the cream has been removed, the calf needs more of the skim milk, or that because the calf is not doing well, it is



NEW DAIRY BUILDING, UNIVERSITY OF MISSOURI

not getting enough milk and to allow it to gorge itself which it will readily do if given an opportunity.

Temperature of the milk. Another precaution that must be taken is to have the milk warm and sweet when fed. Nature furnishes the milk to the calf in this condition, and we must carefully imitate her here. Nothing will so quickly and effectively upset the digestion of a calf as feeding warm milk at one feed and cold milk at another. For the first few weeks the calf is especially sensitive to the temperature of its feed. After it is three months or more old, the milk may be fed somewhat cooler if care be taken to have it the same temperature all the time. Even then, however, the best results are secured when the milk is fed warm. The temperature of the milk should be that of the blood, or approximately 100 degrees. In this matter the feeder should exercise great care and not go by guess or by the feeling of the milk, but should actually use a thermometer often enough to know what blood heat feels like. If a hand separator is used, the milk may possibly be fed while still warm enough if used immediately after separation, but it will usually be necessary to heat it some artificially if used for young calves, especially during cool weather.

Changing to skim milk. For the first two or three weeks the calf should be fed part of its mother's milk. Then it may be gradually changed to a skim milk ration by putting in a small amount of skim milk at first and gradually increasing the amount day by day until at the end of a week or ten days all of the whole milk has been eliminated.

Balancing the ration. As soon as the calf begins to take skim milk it should be taught to eat grain. This it will do when it is three or four weeks old. This may be best accomplished by putting a little corn meal in the calf's mouth after the milk is

drunk. In a few days it will begin to relish the meal and expect it. If then the meal be offered in a box the calf will begin to eat without assistance. When once taught to eat grain, the calf is well started towards making good growth. Shelled corn may be used quite as successfully as corn meal after the calf is a month old. The object in getting the calf to eat this corn meal is to balance the skim milk ration. The fat which was removed in the cream is replaced by the oil and starch of the corn meal. Flaxseed meal, that is the whole flaxseed ground, and not oil cake meal, is also recommended by some and fills the want very well, especially during the first two or three weeks. Experiments made at the Iowa and Kansas Experiment Stations show, however, that corn or kafir corn meal answers the purpose quite as well and has the advantage of being much cheaper and always at hand. When the calf gets to eating grain and hay or grass freely, the grain should be made part oats or bran or oil cake meal, especially for the heifers designed for dairy purposes, as these animals should never be allowed to get too fat.

Feeding hay and pasturing. Calves will begin to eat hay if it is put before them, about as soon as they will eat grain. For young calves timothy hay probably is preferable to clover, as the latter is rather too laxative and helps to produce scours, the most common difficulty in calf raising. When turned out to grass the calves are as well supplied as can be with rough feed, but care should be taken to get them on grass gradually so they will not get off their feed.

Importance of Sweet Milk. In order to make a success of raising the calf on skim milk the condition of the milk must be uniformly sweet. Probably nothing can be done that will produce indigestion and scours with more certainty than to feed sweet milk one day and sour the next. The younger the calf the more sensitive it is on this point. After a calf is

well started, it is possible to raise it on sour milk provided it is fed in the same condition every day, but the results are always unsatisfactory.

THE CREAMERY AND THE SKIM MILK CALF.

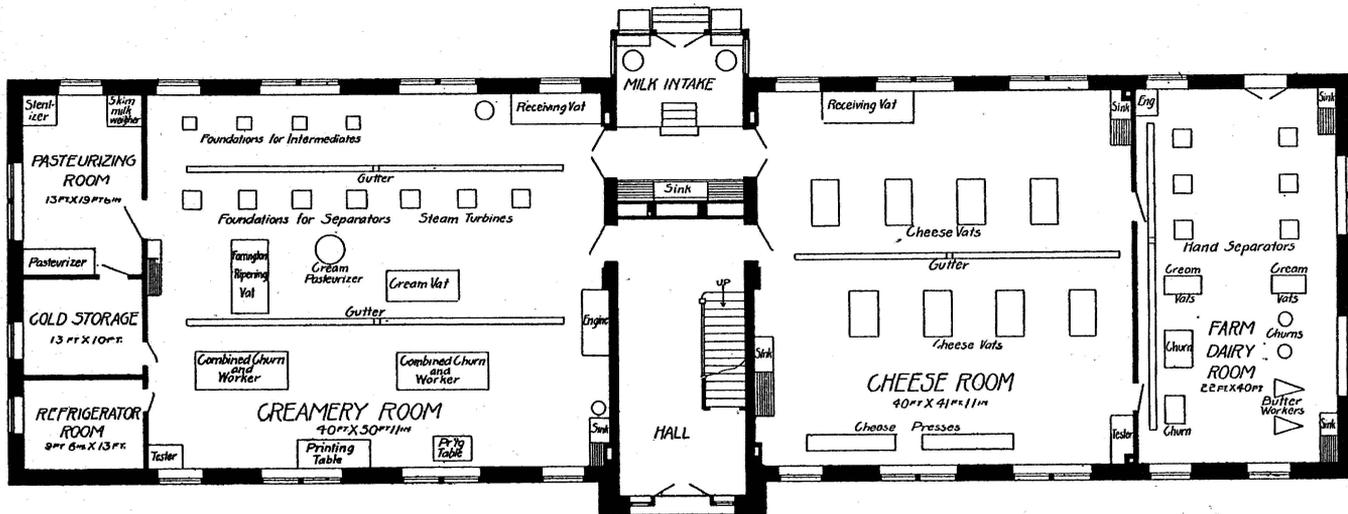
The creamery and skim station systems have been the cause of much trouble with sour milk. Where the milk is hauled several miles in the hot sun, warmed to the proper temperature for separating, and then sent home at just the right temperature to sour most rapidly, it results in the milk being sour much of the time when received by the owners, especially during the hot weather. This has been one common reason for poor success in raising calves even where the creamery system is fairly well developed. Fortunately a means has been devised to remedy this trouble to a great extent. Within two or three years many of the most successful creameries have begun to sterilize the skim milk as it is generally called, before sending it back from the factory. This consists in heating it to at least 180 degrees by using steam in most cases from the engine exhaust. This hot milk is put into cans and taken home without cooling. This scalding checks the souring, and such milk should remain sweet until the following day, and if thoroughly cooled can be kept over Sunday. In this way the calf can be fed on sweet milk and good results had with creamery skim milk. The Kansas Experiment Station raised calves on such milk that gained just as much and did as well as others fed milk separated with a hand separator and fed at once. This heating of the skim milk can not be done successfully unless the milk is brought to the creamery in a sweet condition by the farmer. So the responsibility in this important matter of getting good skim milk back from the creamery rests on the farmer and the creameryman equally. When sterilized milk is first given to calves, they are apt to object somewhat, but in

a few days they take it readily and do well. The general experience seems to show it is less apt to produce scours than is unheated milk. Every farmer who is patronizing a creamery and raising calves should insist that the skim milk returned to him be sterilized. The creameries or skim stations will find it of benefit both to themselves and their patrons to do this. Cans are found to be much easier kept clean when the skim milk is heated, and the condition of the milk when received at the factory is considerably improved on this account.

THE HAND SEPARATOR AND THE SKIM MILK CALF.

The rapid introduction of the hand separator is the feature of the times in the dairy industry. It is largely solving the question of getting good skim milk for calf raising as well as having several other important advantages. Warm sweet skim milk separated within a few minutes after being drawn from the cow is in the best possible condition for the calf, and by observing the points mentioned in this Bulletin and as practiced by the most successful dairymen, little trouble will be had in raising as good calves as are raised in any way. The majority of those producing cream or butter for sale, insist on some means of raising the calf satisfactorily, and the hand separator seems to fill the want better than any other system.

Importance of Keeping Pails Clean. One of the most common causes of sickness in hand raised calves is feeding from dirty pails or cans. Every utensil which comes in contact with milk to be used for feeding, should be kept clean and scalded as thoroughly as though the food were to be used for the owner's family. A good rule is to keep the calf pails as clean as the milk pails. In feeding grain, no more should be fed than will be eaten up clean. If grain is allowed to remain in a trough it often becomes damp and



FIRST FLOOR PLAN
 OF
 DAIRY BUILDING
 UNIVERSITY OF MISSOURI
 :: 1902 ::

partly decayed, and may cause sickness just as a dirty pail will often do.

Clean pens and barns a Necessity. Another point to be kept in mind is that the young calf must be kept in a clean well bedded stall while in the barn. Experience has taught many men that a calf will not do well in a damp dirty pen or stall. The calf needs all the sunlight it can get and the well lighted stall is always best. In the summer the calf should have access to a small pasture with plenty of shade and a darkened shed to go into away from the flies during the heat of the day.

Plenty of Water Needed. An abundance of clean water should be accessible at all times or at frequent intervals, as the calf is not satisfied with milk alone as a drink and wants to drink a little water at a time quite often during the day. Salt should also be within reach when the calf is old enough to eat grain and hay.

HAVE COWS CALVE IN FALL.

A calf can be raised better especially on creamery skim milk if dropped in the fall. The cold weather enables the farmer to get the skim milk back in better condition than during the summer months. The calf can be kept growing nicely on milk until the grass comes, then weaned and turned out to pasture, without checking its growth in the least. The advantage in raising the calf is only one of several points in favor of fall calving. The cow calving in the fall will produce more milk in a year than one calving in the spring, as she gets a new start when the grass comes in the spring, and will milk almost like a fresh cow. Again, the cow is dry for six or eight weeks during the worst time of the year to keep up the milk flow, the hot dry part of the summer. Fall cows

give the largest part of their milk when it is highest in price and when the owner has the most time to care for her, to market her product and to raise the calf.

Stanchions for Feeding Skim Milk Calves. A person having skim milk calves to feed should by all means have stanchions for fastening them while they are eating. It is not only a great labor saving device, but allows each calf to get its share of milk and grain better than any other way. Calves should never be fed milk in a trough, as some will drink faster than others and will get more than they need, and others will be underfed. Unless calves are of the same age they will not all need the same amount. The same applies to the feeding of grain. The stanchion is the best means of avoiding this trouble. These stanchions for calves are made like the ordinary rigid stanchions for cows, except they need not be over three feet high. The feed trough is put in front with divisions to keep the feed of each calf separate. The pail of milk is set in the trough for the calf to drink; after drinking the milk the proper amount of grain is put in the trough and the calves left tied until their mouths are dry. Then they will not form the habit of sucking each other, which is a point of considerable importance.

Stanchions can be easily fixed on a board fence by taking out the two center boards and fastening the uprights to the top and bottom boards. Professor Otis of the Kansas Agricultural College gives the following advice in regard to making stanchions.

“Excellent stanchions can be made for calves out of plain fencing for the upright pieces, 2x4 studding for the horizontal pieces at the top, with fencing boards at the bottom. The stanchions are forty-two inches high, twenty-eight inches apart from center to center, and allow four and a half inches apiece

for the neck. The feed trough is twelve inches wide, four inches deep, and runs the full length of the stanchions."

Weaning Skim Milk Calves. No difficulty will be experienced in weaning a skim milk calf. It early becomes accustomed to eating grain and grass or hay. When it is five or six months old the milk can be gradually reduced in amount and the calf will scarcely notice the change, and the growth will not be checked in the least if the animal is well fed at this time.

Care After Weaning. As far as care and feeding is concerned after weaning, it makes no difference whether a calf is raised by the cow or on skim milk. If the calf is dropped in the fall and is weaned at grass time, it will thrive on a good pasture with no grain. If weaned in the fall, a liberal feed of clover, alfalfa or cowpea hay with a small allowance of grain, will keep them growing through the winter. If it is intended to fit those intended for beef so they will go on the market at an early age, a division should be made. Those intended for beef should be fed a heavier and more fattening grain ration than the heifers intended for dairy cows. The latter should be kept in a thrifty growing condition but not allowed to get excessively fat.

SUMMARY.

The principal points to be observed in raising calves may be briefly stated as follows:

The calf should be taken away from its mother by the third day or earlier. The calf should have its mother's milk for about two weeks. The proper amount to feed a calf the first two or three weeks is about five or six quarts per day, and no more can be given without danger of indigestion. As the calf grows older it will take more, but never should have more

than eight or nine quarts per day. The milk must be fed always at about blood heat. Cold milk will almost always cause scours if fed a young calf. When the calf is about three weeks old the milk ration is gradually changed to skim milk, using about a week to make the change.

SKIM MILK FOR PIG FEEDING.

As a rule more skim milk is furnished by a herd of cows than is required for raising the calves. An average cow should furnish from 500 to 1000 pounds, and a good dairy cow 3000 or more pounds of skim milk per year in excess of what the calf needs. Again, in many herds of special dairy cows only a portion of the calves are raised. These conditions give a surplus of skim milk in most cases when cream is sold or butter made. One of the best uses that can be made of this surplus is to feed it to pigs. Under some conditions as large returns can be realized from feeding skim milk to pigs as to calves. The high value of this product is seldom appreciated even in the older dairy sections. Professor Jordan says* "As a means of promoting growth and a condition of health and vigor, and also as a supplement to cereal grain products skim milk and buttermilk are not excelled, and perhaps not equalled by any other feeding stuffs." Professor Henry summarizes the results of feeding experiments with eighty-eight pigs in the following statement:

"When feeding 1 pound of corn meal with from 1-3 pounds of separator skim milk, 327 pounds of skim milk saves 100 pounds of meal.

When feeding 1 pound of corn meal with from 3-5 pounds of separator skim milk, 446 pounds of skim milk saves 100 pounds of meal.

When feeding 1 pound of corn meal with from 5-7 pounds of separator skim milk, 574 pounds of skim milk saves 100 pounds of meal.

When feeding 1 pound of corn meal with from 7-9 pounds of separator skim milk, 552 pounds of skim milk saves 100 pounds of meal.

Average of all, 475 pounds of skim milk equals 100 pounds of meal."

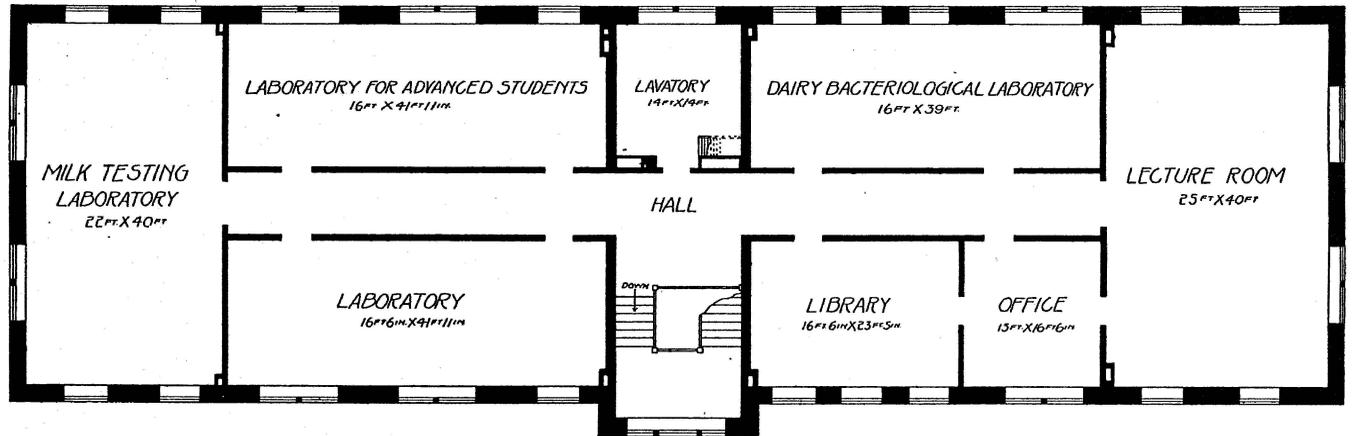
*Jordan—The Feeding of Animals.

He places the following money value on skim milk as found by these experiments:

Value of corn per bushel	Value 100 pounds skim milk	
	When feeding 1-3 pounds skim milk to 1 pound corn	When feeding 7-9 pounds skim milk to 1 pound corn
28 cents	15 cents	9 cents.
33.6 cents.	18 cents	11 cents.
39.2 cents.....	21 cents	13 cents.
44.8 cents.....	24 cents	15 cents.
50.4 cents.....	28 cents	16 cents.
56 cents	31 cents.....	18 cents.
84 cents.....	46 cents.....	27 cents.

In discussing these results Professor Henry* says: "Those familiar with this feeding stuff, appreciating its worth for bone and muscle building, know that in many cases it has a higher value than here given, especially for growing pigs." The principal reason for the high value of skim milk as a feed for growing pigs is that it is essentially a growth producing food containing all these elements originally in the milk. It is a well known fact that in the corn belt the tendency is to feed pigs too much of a fattening ration in the form of corn. Such a ration lacks the growth making elements which are supplied in the best form by skim milk and buttermilk. In feeding skim milk to pigs it is neither necessary nor desirable to feed middlings with it as is often thought proper. Skim milk naturally goes best with corn which is largely fat producing. A small portion of the grain ration, however, may be middlings if desired. One common mistake in feeding skim milk to pigs is overfeeding. If allowed, they will gorge themselves with the milk and will not thrive as they would on less

*Henry's Feeds and Feeding, p. 573.



SECOND FLOOR PLAN
 OF
 DAIRY BUILDING
 UNIVERSITY OF MISSOURI
 :: 1902 ::

milk and more grain. The results of experiments carried on by Henry, Linfield and Robertson, show in every case that the best results were obtained when about one pound of corn was fed to three of skim milk. For economy in feeding the proportions of grain and milk fed will depend somewhat upon the prices of each. If corn is high and supply of skim milk abundant, larger amounts of skim milk can be fed than if the relative prices were reversed. Another economical use that can be made of skim milk is to feed it to sows that are suckling pigs. Combined with middlings and corn it is probably as good a ration as can be made for this purpose.

SKIM MILK FOR POULTRY.

Another way of disposing of the surplus skim milk with profit is to feed it to poultry. As a feed for poultry it has the same advantages that have already been pointed out for pigs, that is to say, it furnishes the material for making growth in a palatable easily digested form. For this reason it is especially valuable as an addition to a grain ration which is liable to lack in the materials to make growth.

The Indiana Experiment Station* fed two lots of growing chickens exactly alike, except one lot was given all the skim milk it would eat, in addition to the grain ration. The lot having grain but no skim milk made an average gain of 2.62 ounces per week. The lot receiving skim milk made a gain per week of 4.46 ounces. The conclusion of this experiment was as follows:

"If skim milk be added to the ration fed young chickens, it will increase the consumption of other foods given. The greatest increase in gain was coincident with the period when the greatest amount of skim milk was consumed. Skim milk is especially valuable as a food for young chickens during the

*Bulletin 71.

hot dry weather, and becomes of less importance as the chickens grow older and the weather becomes cooler.”

The New York Experiment Station found skim milk a very economical feed for producing growth in chickens. In these experiments the skim milk was valued at 25 cents per hundred pounds, but some careful poultry feeders believe 50 cents per hundred not too high a valuation. Skim milk can be fed sweet or after it is quite thick and sour. It is necessary in feeding it in any form to poultry, to take great care that the troughs or utensils in which it is fed be kept clean. Lack of attention to this point is about the only cause of poor results from feeding skim milk as an addition to the grain ration for poultry.