



How young goats are fed has a very large impact on how well they will produce throughout their lifetime.



Nutrition of the Young Goat: Birth to Breeding

The feeding management of the herd's young goats is critical to the overall success of the farm enterprise, regardless of the production system (meat, milk and mohair). In all three systems, young goat kids are raised either as replacement stock, or for slaughter. Which of these two categories goat kids fall into, will determine how quickly you want them to gain weight and what feeding program they are on. To make appropriate feeding management decisions, producers have to keep in mind the physiological changes that a young goat's digestive system goes through with age. These changes affect the types and amounts of feed that young goats can eat, and thereby their nutritional requirements. They also affect how management techniques should be carried out (specifically pre- and post-weaning management) to minimize growth checks or setbacks during the adjustment periods.

At birth, the digestive system of the young goat is very similar to that of the pig and human (explaining the term 'preruminant'). During these first stages of milk feeding, the abomasum (true stomach) and small intestine play a relatively important role with respect to digestion and nutrition. In young goats, and other young ruminants, the suckling reflex triggers the oesophageal groove to close so that milk bypasses the rumen and flows directly in to the abomasum where clotting and some digestion occurs. Milk protein is rapidly digested in the small intestine, as is lactose. If the oesophageal groove does not

close, for whatever reason, then milk goes into the rumen where it 'ferments', allowing digestive upsets to become problems.

When the young goats begin to eat solid food (forages and grains), these feeds may stay in the rumen and lead to development of the microbial population. The rumen-reticulum and the large intestine begin to increase more rapidly at the expense of the abomasum and small intestine. The change from preruminant to ruminant is a gradual process. Fibrous feedstuffs (forages) encourage rumen development and appear to speed up the development of the muscles of the rumen wall (Morand-Fehr et al, 1982), which are important in rumen digestion and mixing of rumen contents.

These changes in the digestive system have a large impact on the feeding methods used in raising young goats and should be kept in mind during all feeding management decisions.

To be successful, feeding programs have to be well adapted to the nutritional characteristics of the young goat and what the intended end use of that goat (herd replacement or slaughter kid).

Three periods will be dealt with in this article: the milk-feeding period, weaning, and post-weaning, including solid feed.

Milk Feeding Period

The milk-feeding period lasts from birth until the moment when the kid no longer consumes any milk. It can last for as little as three weeks, or as long as 5 or 6 months, depending on the production system.

The first milk a young goat should receive is colostrum. It serves three functions: (1) laxative to aid in the excretion of the muconium lining of the digestive tract. (2) nutritive - provides an excellent energy source for the newborn. Energy reserves in the newborn are limited, and the high fat content of colostrum serves that purpose well. (3) protective - it contains antibodies (immunoglobulins) to protect the newborn goat until its own immune system begins functioning about 3 weeks of age.

It is always advisable to keep a reserve of frozen colostrum on hand to supplement those goats whose dams did not have sufficient quantities. Research with cattle would indicate that it is best to keep colostrum from mature does, insuring maximum titres of antibodies and best protection against harmful bacteria and viruses.

Producers following prevention programs for CAE (Caprine Arthritic Encephalitis), have the added problem of having to confidently identify does that are not carrying the disease, if replacement doe kids are to be fed goat colostrum. Heat treating the colostrum is an option, but has some drawbacks associated with it - ensuring proper temperature is maintained for the specified time period; protein and immunoglobulins possibly being destroyed by the heat treatment. The other option available, of course, are to use one, or a combination of the following: cow, sheep colostrum, or commercially prepared colostrum substitutes.

Nursed by Dam or Separated from Dam

Research in Cyprus (Louca, Mavrogenis, Lawlor, 1975) has shown there is very little difference in growth of young goats that are raised by their dam or fed milk replacer, unless weaned at a young age (35 days). With early weaning, kids raised by their dams were heavier than those fed milk replacer.

However, by 70 days of age there was little or no difference in the weights of the two groups as seen in Table 2.

Type of Milk Feeding

Several experiments have compared performance of young goats raised on goat milk, cow milk, or milk replacer. The findings indicate that young goats use milk substitutes very well. Meaning that they can adapt to any of these readily with growth and health being maintained. Another conclusion drawn from the research is kids can grow equally well on all three milks. The key factor determined to affect growth rate is quality of the milk (fat content and dry matter content). Kids will grow just as well on good quality milk replacer as on goat milk. Feed efficiency appeared to be higher (less milk for the same weight gain) with goat milk especially during the first 30 days.

If using milk replacer, the question often comes up whether to use goat, lamb, or calf milk replacer, French studies would indicate that it does not matter, what is important is the quality of the replacer. Kids perform best on replacer where the protein is 100% milk protein. One study found that growth was 20% less in kids fed milk replacer where part of the protein was soybean protein (Tanabe and Kameoka, 1977). This was found to be partly caused by the decrease in digestibility of the soybean protein compared to that of milk protein. The fat content of the replacer is basically used by the goat as an energy source. The type of fat does not appear to be important as the type of protein with respect to gains, but the amount of fat is (no higher than 30%). Milkfat (butterfat) is the preference (but is costly). Animal fat and vegetable oils have been used successfully in trials with lambs (ARC, 1980) and goat kids (Morand-Fehr, 1977). French studies with goats indicated that as long as the energy level of the milk substitute did not change, the gains were unaffected.

Table 2. Effects of rearing method and age at weaning on performance of Damascus kids.

	Rearing Method			
	Artificial		Natural	
Age at Weaning (days)	35.0	70.0	35.0	70.0
Birth Wt. (kg)	4.1	3.9	4.0	4.8
35 day Wt. (kg)	8.8	9.8	10.1	10.4
70 day Wt. (kg)	12.1	18.0	14.2	17.1
Final Wt. (kg)	35.0	36.0	35.1	36.2

In Ontario, we are fortunate to have high quality goat milk replacers available commercially. It is not recommended to use lamb milk replacer (since the fat content is higher) unless the reconstituted milk is diluted from that indicated for lambs. Check with the company as to what their recommended mixing instructions would be.

The majority of female goats are raised separate from their dams in Ontario, with the major reason being to control or reduce the incidence of Caprine Arthritic Encephalitis (CAE). For an artificial rearing program to be successful, certain practices must be followed.

Milk should be:

- fed with a nipple devise
- available to kids 24 hrs/day*
- cool or cold (6-10°C)

**intake and gain are higher but feed efficiency is 8 - 12% less.*

Kids fed with nipple devises (bottle or kid bar) have fewer digestive problems and less bloating than those fed with a pail or pan. As well, cool or cold milk prevents them from drinking large quantities of milk at a time, again reducing digestive problems. Kids fed cold milk do not diarrhea as quickly as those fed warm milk, for the same reasons. Free choice access to milk is preferred especially with respect to health and less digestive problems. Economics, however, often dictates just how much, or how little, milk replacer you can afford to feed. Satisfactory growth, and not necessarily maxi-

mum growth has to be emphasized (at least with replacements). Fehr and Hervieu (1975), determined that it is not advisable to use less than 7 kilograms of milk replacer powder per goat kid (see Table 1).

Kids should be housed:

- draught free
- at 12°C (may need supplementary heat to achieve this)
- well bedded (clean, dry)

These housing conditions appear optimum for best growth rate, feed efficiency and maintaining good health status in young growing goats.

As with other animals, there is a linear relationship between the amount eaten and live weight gain. The amount of milk consumed by the young goat depends on the level of solids (concentration) of the milk. The more concentrated, the less amount consumed in terms of volume. In terms of dry matter, the amount consumed would be the same or greater.

Studies indicate the following for suggested, reconstituted milk replacer concentrations:

- 16% for goat kids fed 2 times/day
- 24% for once a day feeding programs*

**make sure water is available at all other times (preferable with nipple access)*

Weaning Period

Weaning can be a stressful period in the young goats' life, and is often characterized by a slowing, stoppage of growth, or sometimes even

loss of weight gain. This is referred to as weaning shock. The level or degree of shock depends on age and weight of the kids as well as the

Table 1. Particulars of feeding pattern in young female goats before and after weaning.

	2 Days before weaning	First 3 days after weaning	7 & 8th days after weaning	14-15th days after weaning
Intake of dry matter (g/d)*	214.6	432.7	609.8	668.6
Intake of DM/Kg Metabolic wt (g/d/ KgW ^{0.75})	29.2	58.0	78.1	83.3
Duration of Ingestion (min/d)	126.2	176.2	217.6	208.7
Number of Meals	9.7	9.6	6.8	7.0
Avg Duration of Meals	25.0	29.4	47.5	41.8
Rate of Ingestion (g DM/min)				
Hay	1.45	1.21	1.30	1.25
Concentrate	4.53	6.14	8.58	13.75
Ratio stems/leaves in lucerne hay				
Given	50.3/48.8	50.3/48.8	50.3/48.8	50.3/48.8
Refused	86.0/13.2	88.0/8.8	80.5/17.0	79.7/18.3

* excluding milk replacer

feeding program before weaning.

From studies with both goats and lambs, weight at weaning is more important than age at weaning when

attempting to minimize weaning shock. Lambs and goat kids that are consuming solid feeds also experienced less growth check than those that were not. Recommended minimum weights and feed intakes for early weaning, have been determined to be when kids have reached 2.5 times their birth weight and are consuming at least 30 grams of solid feeds, daily.

Other factors affect weaning shock in young goats. Male kids are more susceptible to weaning shock than females (Fehr, 1981). Healthy kids experience less of a shock than kids fighting a disease or infection, such as coccidiosis.

Every effort should be made to minimize factors that will stress the kids, especially if those factors can be removed or minimized by management.

Weaning Method

Weaning can be achieved either gradually or suddenly. In older, heavier kids, there is little difference between the two methods with respect to future performance of kids. With early weaning, however, research indicates that stepwise weaning would be preferable (Table 3). This allows time for kids to adapt to relying on solid feeds to supply more of their nutrients.

If only a limited amount of milk is available, it would appear that weaning stress is less in kids that have had restricted access for a longer time, than with kids that consumed the same amount of powder, but had free access over a shorter time. This is due to the negative relationship between milk intake and dry feed intake

before weaning. If a larger amount of powder is available to feed then ad libitum and short feeding program would be preferable (Fehr, 1981).

Growth Period After Weaning

How young goats are fed after weaning will be determined by whether they are replacement doe kids or intended for market. Weight gain will vary according to the level of dry matter intake and particularly the level of energy intake.

Generally, with market animals, maximum rate of gain is desirable. The quicker an animal reaches market weight, the lower the daily cost of feed, and hopefully the potential for a good dollar return.

With replacement animals, emphasis should be placed more on rumen development and gut capacity, with rate of gain being secondary. As adults, goats with greater gut capacity will have the ability to consume more feed and thereby, meet nutrient demands for higher production. Avoid too high a level of fattening in young replacement does as this can have a negative impact on future performance, especially in terms of milk production.

The protein percentage in the grain can have a marked influence on gain. Tanabe et al. (1975) demonstrated that a 16% grain mix should be fed after weaning. In early weaning situations, it is advisable to maintain a higher level of protein (19%), since dry matter will be less in these smaller kids. As growth and weight increases, the protein level can be reduced in the grain mix.

Table 3. Effect of composition of milk replacer on performance of young female goats.

Composition of milk replacer (%)			
tallow	20	15	15
lactoserum	12	30	19
starch	6	6	16
Live Wt. of young female goats (kg)			
At birth	3.87	3.81	3.80
At 5 wks (weaning)	9.57	9.77	9.57
At 12 wks	18.56	18.73	18.74
Average Daily Wt. Gain (g/d)*			
0 to 5 wks	163	170	165
0 to 12 wks	175	178	178

* the effect of composition of milk replacer is not significant

Type of protein can affect growth rate. Fish meal gave the best results right after weaning, followed by soybean meal and field bean meal. Linseed meal (oilcake) was not included in the experiment. Urea can be substituted successfully for part of the soybean meal, as long as the percentage of urea does not exceed 2.25% of the grain (Haryu, 1975). Palatability problems can be experienced with urea, and it is also important to ensure that the energy content of the grain mix is sufficient for efficient use of the protein.

Conclusion

Although there are still large gaps in goat and especially, young goat nutrition, sufficient data is available to enable producers to do a good job of feeding and raising young goats. As with all young livestock, it cannot be emphasized enough, that how young goats are fed in the first 24 hours of life...; the first week of life...; and the first month of life... has a very large impact on how well they grow in their first year, and how well they produce (kids and/or milk) throughout their lifetime.

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