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# Feeding Milk Replacer Versus Whole Milk

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## Introduction

When it comes to the decision to feed whole milk or milk replacer, there are many factors that one must consider. Nutritional content, disease risk, convenience and cost are the major variables that will affect your decision.

## Nutrition

Nutritionally, whole milk is almost always a higher energy product than milk replacer. This is the result of whole milk containing a larger amount of fat than most milk replacers. Holstein milk will be roughly equivalent to a 26:31 milk replacer. This can be very beneficial, especially in the winter months when a calf's energy demands can increase by more than 50%.

As a side note, Jersey calves, due to their higher surface area to mass ratio, will need an additional 20% in maintenance energy just to account for excess heat losses when compared to Holstein. Be sure to take this fact into account when choosing what to feed Jersey calves.

Milk replacers which are formulated to have higher protein-to-fat ratios can be used in accelerated calf feeding programs to encourage intakes and increase growth. Be sure to exam the quality of the protein sources found in the different milk replacers as some formulations will use cheaper plant-based sources of protein that may not have the proper amino acid profiles for calf growth. Milk replacer can also be more consistent in nutrient content when compared to whole milk, specifically waste milk which has great variability.

Table 1. Energy values of liquid feeds.

| Milk fed | Energy (Mcal/lb) |
|---|---|
| **20:20 Milk Replacer** | 2.1 |
| **28:20 Milk Replacer** | 2.2 |
| **Whole Milk (26:31)** | 2.4 |

Table 2. Nutrient requirements of a 100 lb calf under thermoneutral conditions[1,2]

| Gain (lb/day) | ME (mcal/d) | DMI (lbs/d) | CP (% DM) |
|---|---|---|---|
| **0.44** | 2.35 | 1.12 | 18.0 |
| **0.88** | 2.89 | 1.40 | 23.4 |
| **1.32** | 3.48 | 1.67 | 26.6 |
| **1.76** | 4.13 | 1.98 | 27.5 |
| **2.20** | 4.80 | 2.39 | 28.7 |

[1] *Van Amburgh & Drackley, 2005.*
[2] *ME= Metabolizable energy, DMI = dry matter intake and CP = crude protein.*

## Disease Risk

Disease risk must be taken into account when choosing between whole milk and milk replacer. Although, whole milk is a higher disease risk when compared to milk replacer, it should also be noted that calves fed on a higher plane of nutrition, like that offered by feeding whole milk, are better positioned to be able to fight off diseases and tend to be healthier than animals fed at a lower energy plane. Milk replacer is not without its risks though, as improper mixing, irregular feeding intervals, and the feeding of milk replacer at improper temperatures can increase the risk of calves dying from diseases like Acute Bloat Syndrome. Waste milk fed from mastitis cows can be fed but can have variable nutritional content. It is not recommended to feed unpasteurized waste milk to group fed calves as cross suckling could potentially infect a calf with a mastitis causing pathogen. If waste milk contains

Antibiotics, there is also a chance that those antibiotics could be absorbed into the tissues of the calf which has the potential of causing a residue if that calf were to be harvested for veal. Whole milk is a great medium for bacterial growth and can be challenging to handle properly prior to being delivered to calves. Ideally, the milk must be cooled to refrigeration temperatures for storage and then warmed back up to 100°F for feeding to calves.

Pasteurization greatly decreases the bacterial load and is an invaluable tool to help prevent milk borne diseases in calves. *Mycobacterium avium* subspieces *paratuburculosis,* the causative agent of Johne's disease, is destroyed with proper pasteurization, but it is not generally recommended to feed whole milk if there is a high prevalence of Johne's disease on a farm. Pathogens such as Bovine Viral Diarrhea Virus (BVD), Bovine Leukosis Virus (BLV), and *Mycoplasma spp.* are also destroyed during pasteurization. However, bacterial levels can quickly rise again, and pasteurized milk needs to be cooled back down to refrigeration temperatures unless it is fed immediately after pasteurization.

Acidifying milk is another option for pathogen control. The low pH kills most of the pathogenic bacteria and allows for short term storage at feeding temperatures vs. refrigeration temperatures. This allows for greater flexibility for use in ad-lib feeding systems where milk is accessible to the calves throughout the day. Care must be taken when adding acid to ensure the proper pH is reached and the milk does not curdle during the process. Pre-acidified milk replacers are also available. Assuming they are mixed according to the manufacturer's recommendations, pH of the milk should be at the optimum level.

## Convenience

Convenience is also a large driver when considering what type of liquid feed to use. Handling large amounts of whole milk can be very cumbersome unless a pump system is available. The perishable nature of milk makes storage very difficult for any extended period of time so it must be used shortly after harvest. If refrigeration is available, milk should still only be kept for a couple days. Milk replacer allows for only the needed amount to be mixed directly prior to feeding and storage takes up minimal space. Mixing large amounts of milk replacer may require additional equipment, such as water flow meters and scales, which can require additional costs not needed with whole milk. It is also imperative that you have a quality potable water source when mixing milk replacer.

## Cost

The cost of a liquid calf feeding program can be quite variable. The cost of milk replacers can vary based on the company selling the product, the nutritional value, and the current market for many of the protein byproducts used as ingredients. The amount of waste milk available on a farm, the price of salable milk, cost of pasteurization, and labor can all greatly affect the cost of a whole milk feeding program. The quality of calf produced can also impact the true "cost" of a liquid feeding program. One way to measure the cost of feeding calves is to calculate the cost per pound of gain from birth to weaning. This value allows you to accurately compare different feeding strategies while accounting for both feed costs and calf performance. For example, Farm A feeds whole milk and has a calf feeding cost of $3.00 per day, Farm B feeds a 20/20 milk replacer at a cost of $2.00 per day. Farm A gets 2.0 lb/day of gain per day, while Farm B gets 1.0 lb/day. Farm A has a $1.50 cost per pound of gain, while Farm B has a $2.00 cost per pound of gain. The increased gain on Farm A also decreases treatment expenses with calves staying healthier. The calves from Farm A maintain this increased growth, allowing for earlier breeding and age at first calf.

## Bottom Line:

Whole milk can be an economical alternative to milk replacer, but it has challenges with storage and disease transfer. Calves fed whole milk often have higher rates of gain per pound of milk fed. Whenever possible, whole milk should be pasteurized before feeding. If you are feeding unpasteurized milk, it is better to feed salable milk than dump milk.

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