Why whole milk isn't enough

CONTAMINATION RISKS

Recognizing the potential risk of introducing pathogenic bacteria and viruses to calves via waste milk, many operations now pasteurize their waste milk before feeding it. While effective pasteurizing can address disease-prevention goals for feeding whole milk, it may not rectify a series of other important concerns.

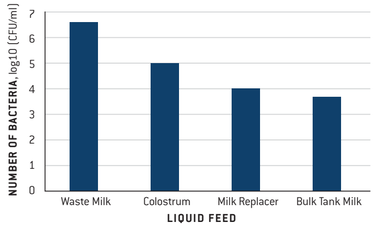
PATHOGENS OF CONCERN
Can be shed in the milk or arise through environmental contamination

- *Salmonella spp.*
- *E. coli*
- *Mycoplasma bovis*
- *Mycobacterium paratuberculosis* (Johne's)

SOURCES OF CONTAMINATION

- Pre-pasteurized waste milk
- Improper or incomplete pasteurization
- Post-pasteurization handling

BACTERIAL COUNT IN SOME COMMON CALF LIQUID FEEDS
(Selim and Cullor, 1997)



Selim, S.A. and J.S. Cullor. 1997. Number of viable bacteria and presumptive antibiotic residues in milk fed to calves on commercial dairies. J.A.V.M.A. 211:1029-1035.

NUTRITIONAL CONSISTENCY

The very nature of waste milk makes it a product that can be inconsistent from day-to-day and farm-to-farm. It typically is made up of milk from medicated, sick or fresh cows. Due the fact that colostrum is higher in fat, protein and total solids than traditional whole milk, a large number of fresh cows can alter the nutritional content of a batch of waste milk. On the other hand, a large percentage of cows with mastitis or other illnesses could result in waste milk that is lower in nutrients.

Parlor-management and/or pasteurizing procedures can result in excess water being flushed into the milk supply. In addition, waste milk may not be agitated as regularly as salable milk on the dairy.

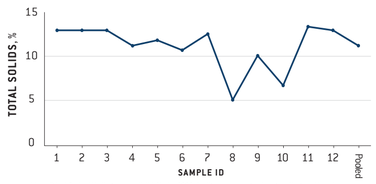
NUTRIENT VARIATION OF WASTE MILK[1]
(Jorgensen et al., 2006)

NUTRIENT	MEAN	RANGE
Protein, % as-fed	3.51	2.89-5.10
Fat, % as-fed	3.90	2.79-4.70
Protein, % dry matter	28.1	23.1-40.8
Fat, % dry matter	31.2	22.3-37.6

[1] Jorgensen, M.A., P.C. Hoffman, and A.J. Nytes. 2006. Case study: a field survey of on-farm milk pastuerization efficacy. Prof. Anim. Scientist. 22:472-476.

As an example of waste milk inconsistency, a Wisconsin study[1] of pasteurized waste milk from 31 commercial dairies and calf-raising operations showed that fat content (DM basis) ranged from 22.3 to 37.6%, and protein varied from 23.1 to 40.8%.

TOTAL SOLIDS OF WASTE MILK SAMPLES DELIVERED TO SINGLE CALF RANCH
(Moore et al., 2009)



Moore D.A., J. Taylor, M.L. Hartman, and W.M. Sischo. 2009. Quality assessments of waste milk at a calf ranch. J. Dairy Sci.92:3503–3509.

WHOLE MILK: Make a good thing better

Nearly half of all dairy calves raised in the United States are fed a diet that includes whole milk in the preweaned stage. The source of this nutrition is primarily waste milk, salable milk, or a combination that may include milk replacer.

Consistency and top nutrition should be the goal of any whole milk program. There are several ways to ensure accurate and complete nutrition in every feeding, maximizing calves' lifetime productivity potential.

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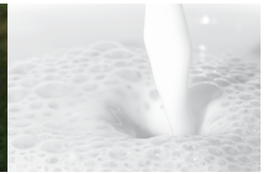


NUTRITIONAL CONTENT

Even if nutrient levels in waste milk were consistent, they are not ideal for optimal calf growth. Typical levels of protein and fat dry matter percents in whole milk are 25-28% and 28-30% respectively; where the ratio of protein-to-fat is less than 1. But it has been documented that a higher percentage of protein in the milk diet promotes lean tissue growth and better stature in calves. A high-fat diet, on the other hand, can result in short, fat heifers that do not meet target breeding criteria until an older age.

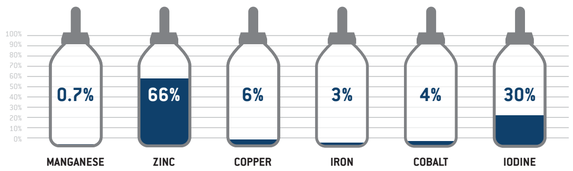
A good guideline is to strive for a protein-to-fat ratio of greater than 1.0 (in other words, more protein than fat). An ideal target is around 1.4 (example: 24:18) which is especially important for intensive nutrition programs that feed preweaned calves on a higher plane of nutrition.

Simply feeding more whole milk adds even more fat to the diet, which may suppress starter-grain intake.

Surprisingly, whole milk also is deficient in a number of vitamins and trace minerals when comparing standard values for whole milk to the National Research Council (NRC 2001)[2] recommendations for dairy calf nutrition. Among the elements with deficiencies are manganese, copper, iron, cobalt, iodine and vitamin E. In addition to these deficiencies, selenium in whole milk is highly variable, ranging from 0.03 mg to 0.5 mg per gallon (Cabellos et al ., 2009)[4]. Starter-grain formulations often are fortified with these vitamins and minerals, but starter-grain intake is minimal in the first few weeks of life.

WHOLE MILK MAY NOT MEET THE NRC AND USDA REQUIREMENTS FOR THE CALF

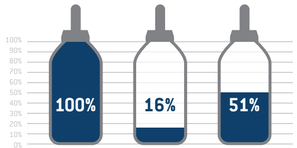
PERCENTAGE OF NRC-RECOMMENDED[2] TRACE MINERALS IN WHOLE MILK



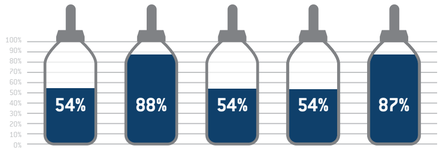
ADDED PROTECTION

Protective agents such as ionophores and larvacides are routinely added to milk replacer, but are not found in whole milk.

PERCENTAGE OF NRC-RECOMMENDED[2] VITAMINS IN WHOLE MILK



PERCENTAGE OF USDA-RECOMMENDED[3] VITAMINS IN WHOLE MILK



[2]NRC. 2001. Nutrient Requirements of Dairy Cattle. 7th ed. Natl. Acad. Press, Washington, DC.

[3]U.S. Department of Agriculture, Agricultural Research Service. 2008. USDA National Nutrient Database for Standard Reference, Release 21. Nutrient Data Laboratory Home Page, http://www.ars.usda.gov/ba/bhnrc/ndl

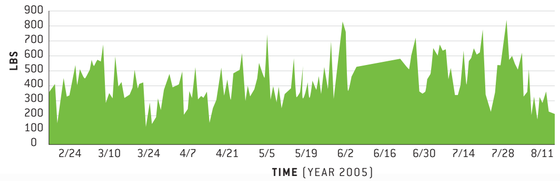
[4]Ceballos, A., J. Sánchez, H. Struhn, J.B. Montgomery, H.W. Barkema, and J.J. Wichtel. 2009. Meta-analysis of the effect of oral selenium supplementation on milk selenium concentration in cattle. J. Dairy Sci. 92:324-342.

SUPPLY

Another challenge with feeding whole milk is that dairies typically only have 30 to 60 percent of the milk supply that they will need to feed all of their heifer calves. A recent field study[5] of a 1,100-cow North Carolina dairy showed that its waste milk supply varied by as much as 300 pounds per day over a two-week period.

Many operations remedy this situation by using salable milk from the bulk tank to make up supply shortfalls. Others use milk replacer to feed either the youngest or oldest calves. However, when milk prices are high, feeding milk that otherwise could be sold becomes an expensive proposition. Using milk replacer usually is a more cost-effective option, but switching calves between milk replacer and whole milk can create inconsistencies in the liquid ration and management challenges of using two feed sources.

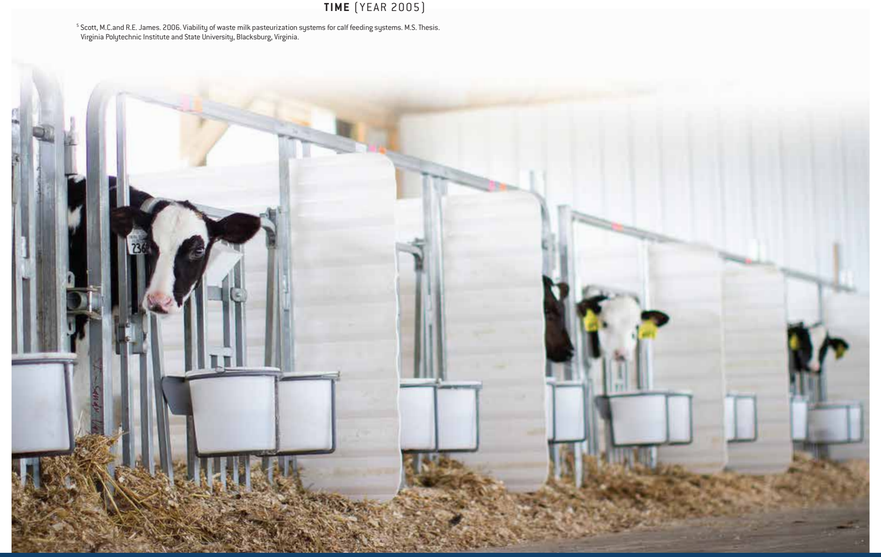
DAILY VARIATION OF WASTE MILK SUPPLY (James and Scott, 2006)



[5] Scott, M.C. and R.E. James. 2006. Viability of waste milk pasteurization systems for calf feeding systems. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Did you know that whole milk fed to calves could come from a variety of sources including:

- Salable milk
- Un-salable (waste) milk
- Colostral milk
- Expired store milk



MAKE A GOOD THING BETTER

Young calves thrive on consistency. Calves are developing babies, and frequent or abrupt changes in their diets can cause digestive upsets, immunosuppression and developmental delays. Just as it is a goal to deliver the consistent and known nutrients to lactating cows in every bite, the liquid ration fed to calves should be equally consistent.

THERE ARE THREE IMPORTANT WAYS THAT MILK ENHANCERS CAN IMPROVE A DAIRY'S SUPPLY OF PASTEURIZED WHOLE MILK:

1 BALANCE

Balancers typically add a higher level of protein and a minimal amount of fat. In addition, when balancing, the total solids and volume of liquid typically are increased as well. When fed at the correct level, balancers can also act as a fortifier bringing in the correct amount of vitamins, minerals and other additives. In summary, when a balancer is used, the protein:fat ratio is improved, the whole milk is fortified and the volume is increased.

BALANCING P:F RATIO	ACHIEVE TARGETED SOLIDS LEVEL	ACT AS FORTIFIER	INCREASE VOLUME
• Add a higher level of protein • Minimal amount of fat			

2 FORTIFY

Fortifiers contain additives such as vitamins and minerals to bring whole milk nutrition content in line with NRC guidelines. Other options include adding larvacides for fly control, and ionophores for growth promotion and coccidiosis prevention. When fortifiers are used, the volume of liquid is not markedly increased.

ADD VITAMINS & MINERALS DEFICIENT IN WHOLE MILK	LARVACIDES FOR FLY CONTROL	COCCIDIOSIS PROTECTION	SPECIALTY ADDITIVES
			• Functional Proteins (e.g. plasma) • MOS, DFMs and essential oils

3 EXTEND

The supply of whole milk can vary considerably and extenders can be used with the primary objective of increasing the liquid milk volume. Extenders, which are commonly complete, non-medicated milk replacers, contribute vitamins and minerals, but the significance is limited by inclusion rate. When using extenders, there is not a focus on changing total solids or protein:fat ratios.

INCREASE VOLUME OF MILK TO BE FED	MAY FORTIFY WITH ADDITIONAL VITAMINS AND MINERALS

Pasteurized milk enhancers can be used in both individual-feeding systems and autofeeders in a group housing setting. They are also highly beneficial in adjusting milk rations to seasonal changes to help animals cope with cold and heat stress.

With the improvements provided by pasteurized milk enhancers, feeding a diet of whole milk can truly be the optimal choice for your preweaned calf nutrition program.

Contact your nutrition consultant for help in optimizing your whole milk or milk replacer program to reach your calf program goals for health and growth.