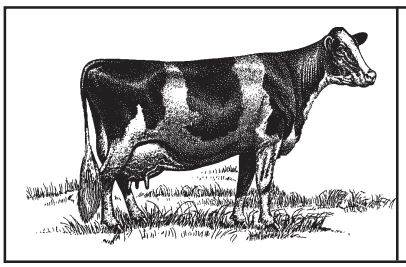

B.C. DAIRY TALK

Can I Change Milk Composition With My Ration?

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With the recent announcement of the Milk Marketing Board to begin a Fluid Skim Off Pricing Formula August 1, 1993, many are asking: can I change milk composition with my ration? The answer is yes, but **beware!** If changes to the ration are done too quickly the health risks can be great and the financial gain minimal!

Should You Change Milk Composition....

Manipulating a ration can change milk composition - the trick is knowing if the change is financially beneficial. It is important to first ask some questions: Will the change result in the desired composition? How well can the change be controlled? What has the milk fat and protein levels been over the last few months and how will this pricing formula affect the milk cheque? Will the change be sufficient to cover any increases in ration cost? Are there any hidden cost increases associated with management, feeding or health changes as a result of the new ration? Are the risks worth taking? Remember to examine the effects on both milk fat and milk protein and calculate all of the risks and benefits. All of these factors must be considered whenever a change in your ration is contemplated.

How Can You Change Milk Composition....

Generally speaking, any dietary change that drops rumen pH changes the type of rumen digestion away from fiber digestion, butterfat production to starch digestion, milk and protein production. However, the problem with this type of digestion is three-fold:

1. As the type of digestion changes, milk fat drops rapidly by as much as 0.1 to 2.0 % points, while milk protein will seldom increase greater than 0.3 to 0.4 % points;
2. The health risks of acidosis, laminitis and displaced abomassums, etc., increases drastically as the rumen pH drops, and;
3. The warning signs of feed imbalances are not always clear and immediate. Feed imbalances can impair long term health and profitability of the herd. Some signs to watch for are: a) more cows with milk protein/fat inversions - a healthy cow should have milk protein approximately 75 to 88% of the milk fat content, depending upon breed; b) milk fat below 3.0% - fat test can drop quickly, but it can also drop slowly as the metabolism responds to the new ration, and; c) more metabolic diseases in the herd over time - from occasional laminitis, ketosis, displaced abomasums or off feed to frequent bouts over numerous cows.

Whenever examining milk protein, it is critical to realize that the factors affecting protein percent are different from the factors affecting protein yield. Milk lactose changes very little and can not be manipulated under any ordinary circumstances.

Factors Affecting Milk Fat and Protein Production.....

1. Amount of Forage in the Ration

Decreasing the amount of forage in relation to the amount of concentrate will quickly decrease milk fat with only a variable and slight increase in milk protein percent. However, to avoid acidosis and its associated problems of laminitis, displaced abomasums, etc., 35% of the Total Ration Dry Matter must come from forage (65% concentrate) during early lactation and 40% forage (60% concentrate) in mid to late lactation.

2. Source and Quality of Fiber

The principle value of fiber is its texture or "scratch" factor. If it is leafy, chopped fine, unpalatable, or very soluble, the value of it as "effective" physical fiber will be lost. Without this "scratch" factor the cows will not be stimulated to ruminate and produce the naturally buffer laden saliva needed for a healthy rumen. The secondary value is the chemical fibre which is measured as Acid Detergent Fiber (ADF). ADF must be maintained at a minimum of 19% ADF (Total Ration Dry Matter) for early lactation and 21% ADF for mid to late lactation cows. If these critical factors are not maintained, health will be negatively effected, milk fat will decrease drastically and milk protein will only be marginally improved.

3. Feed Energy

The nutritional parameter most highly related to milk protein is energy intake. Rations that are: high in energy; have the majority of energy coming from non-structural carbohydrates (NSC); and/or low in fiber (19-21% ADF) will show the greatest impact on milk protein yield. Milk protein percentage may not be increased as the effect on milk yield is often greater than the effect on milk protein yield. Whenever any of these factors are used cow health may be at risk.

Concentrates that are primarily composed of rapidly digested grains (e.g.: barley) will have more effect on depressing fat and increasing protein than slowly digested grains (e.g.: corn). This combined with moist heat processing of concentrates further increases the digestion of starch driving milk fat downward and protein yield up. A maximum of 40% non-structural carbohydrates will allow for maximum production of milk fat, protein and milk yield, yet still maintain animal health.

Cows that are thin or have excessive weight loss in early lactation due to rations that are deficient in energy are more predisposed to low fat tests and depressed milk protein content than cows in proper body condition. Fat cows, because of their potential for decreased feed intake and metabolic problems at calving are also predisposed to low milk, fat and protein production.

Adding fats even within the required boundaries (5 - 7% Total Dry Matter Intake) often decreases milk protein percentage due to the increase in milk volume, but may increase, decrease or not change milk protein yield. Most often the effect is to decrease milk protein yield. This will depend upon the type of fat used, protein quality, other energy sources and complimentation of protein and energy sources.

4. Feed Protein

Generally, improvements in feed protein quality will show an increase in milk yield more than with milk protein. Research has shown some improvements in milk protein by improving the combination of energy sources. Rations that have 18% protein, of which 35 to 40% is undegradable, is showing some improvements in both milk protein percentage and protein yield and is recommended for most lactating cows. Recent work has even shown that dry cows benefit from rations balanced for undegradable protein by producing more milk protein in the following lactation. Excessive protein intake beyond the usual allowance does not normally elevate milk protein content and can negatively effect reproductive function if the animal's protein requirement is exceeded by 15%.

Due to B.C.'s growing conditions, current rates of manure and fertilizer applications and grass mixes, forages tend to be high in degradable protein. If a ration containing this type of forage program is not balanced for degradable

and undegradable proteins the cow's genetic potential for milk protein may not be met. Research suggests this may be due to an imbalance in amino acids. Information in this area is limited and inconsistent; more research is required before a practical and cost effective ration can be developed.

5. Feeding Sequence and Frequency

Feeding 2-4 kg of hay before grain will minimize the drop in rumen pH and help milk and milk fat production under normal conditions. However, in fat test depressing rations that are already too low in fiber, feeding small amounts of hay before grain will not influence milk fat or be sufficient to improve rumen pH.

Feeding four times a day appears to be the lowest effective feeding frequency, while feeding beyond six times a day appears to give no added benefit. Factors that may affect the influence of feeding frequency are animal behavior, amount of grain fed and access time to forages.

6. Feed Processing

The finer the ration, whether it be grain or forage, results in a more rapid digestion and a more acidic rumen. Both will compound the potential for a drastic decrease in milk fat, a marginal increase in milk protein and an increase in health risks (e.g.: laminitis, displaced abomasums).

7. Feed Moisture

Rations that are too wet (> 40% moisture) will not promote proper rumination and can dilute the ration of much needed nutrients. Maximizing the genetic potential for milk components and yield relies on both a healthy rumen and a balanced ration.

8. Abrupt Feed Changes

Changing feeds too quickly may shock the rumen microbial population and cause a shift in the type of digestion occuring. The end result: cows off feed, poor health and disappointing milk and milk component yields. Feed changes should be done gradually over a minimum of 2-3 weeks.

9. Pasture

Lush, spring pasture is low in fiber and highly digestible. Pasture that is well fertilized tends to be higher in soluble protein. The combination of these two factors can drop milk fat **and** milk protein. To maintain milk fat, feed hay before and during pasturing. To maintain or improve milk protein have the ration balanced for all protein fractions (degradable vs. undegradable protein).

10. Feed Additives

Niacin fed at 6 g. per cow per day has shown some improvement in milk protein, particularly in rations with added fat. Regardless of this it is still wise to avoid feeding niacin to thin and under conditioned cows.

Buffers improve acidic rations and prevent a rapid decline in milk fat. Buffers usually do not influence milk protein.

Manipulating Milk Components By Nutrition - Conclusions

* A balanced ration using proven guidelines and feed analysis of homegrown feeds, that meets both the nutritional and physical form requirements, will provide the best opportunity for the dairy cow to express her genetic potential for milk yield, milk fat and milk protein in the most cost effective and healthy manner.

* If decisions are made to alter rations to change milk components, consider the costs of such changes in terms of feeds, production (milk volume, component yields and percentages) and health risks. Costs associated with the change in ration may not be reflected in the financial gain. (See upcoming B.C. Dairy Talk on how to make these calculations.)

* Breeding for milk components has resulted in steady improvements for both milk fat and protein. Consider breeding options for improving milk composition. (See upcoming B.C. Dairy Talk on appropriate selection pressures.)