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Milk Components

Understanding Factors Affecting Milk Composition in Your Dairy Herd

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Most milk marketing orders in the U.S. employ a multiple component pricing system that pays producers on the basis of milk fat, true protein, and other dairy solids. This pricing method derives component values from prices for manufactured dairy products (cheese, butter, nonfat dry milk, and dry whey), which rise and fall with changing market conditions. As a result, milk component levels are important factors in herd management. In addition to being indicators of cow health and nutrition, component levels directly impact farm income. This article describes the variation found in production of milk components, factors that contribute to this variation, and strategies to improve component production.

Generally, fat and protein content of milk are positively correlated within a population of dairy cattle; however, different breeds of cattle vary in average component levels. Holsteins have the lowest fat and protein content, while Jersey and Guernsey breeds have the highest. Because Holsteins produce more milk, they generally have a higher total yield of fat and protein than other breeds.

FACTORS AFFECTING MILK COMPOSITION

There are many factors that can affect milk fat and protein, and many of them can be manipulated to enable you to achieve higher than average levels of milk components. Keep in mind that herds that are below breed average will have more opportunity to improve component levels. Herds that are already above average may have better success by focusing on increasing milk yield, which will increase the total amount of fat and protein produced.

Stage of lactation affects milk protein and fat percentages very similarly. The highest amount of protein and fat in milk is found just after freshening, in colostrum. Levels drop to their lowest point between 25 and 50 days after calving and peak at 250 days as milk production begins to decrease.

Age tends to cause both milk fat and protein to decline as the animal becomes older. Milk fat falls about 0.2% each year from the first to fifth lactation likely as a result of higher production and more udder infections. Protein decreases 0.02% to 0.05% each lactation as animals age.

Season dramatically affects milk fat and protein. The hot, humid months (July and August in the northeast) depress fat and protein content. There is a gradual increase of protein and fat in milk through the fall and peak levels occur in the colder months of winter. As temperatures increase through the spring, component levels are gradually decreased. These changes may be indicative of feed intake patterns, which are lower in summer due to changes in weather and temperature.

Mastitis infections reduce fat and casein but increase blood protein content of milk. Somatic cell count also is elevated during mastitis. Herds that have continuous mastitis and SCC problems take a double or triple hit on milk price. The component value is reduced, plus in some Federal Orders there is a deduction for SCC over 350,000 cells/mL. Quality premiums from the milk handler may be lost as well.

Milk fat and protein depression also can occur from mechanical errors, such as cooling problems in the bulk tank, sampling problems, and over agitation in the pipeline.

Genetics and inheritance account for 55% of the difference between cows in protein and fat content of milk. Heritability indicates the proportion of observed differences that are due to genetics, while the reciprocal is assumed to be due to environmental factors. Protein and fat percentages are more highly heritable than yield of milk and components. Milk yield is positively correlated to yield of fat and protein; however, milk yield is negatively correlated to fat and protein percentages. For many years, sires have been selected for high yields of milk, which has resulted in very slow increases in fat and protein percentages over time. Herds that are more than one standard deviation below the breed average for fat or protein may benefit from including component yields in sire selection criteria. However, because fat and protein percentages are negatively related to milk yield, changes in herd component percentages are not likely to be achieved through genetic selection alone.

Of all the factors affecting milk composition, **nutrition and feeding practices** are most likely to cause problems; however, management changes made here are able to quickly and dramatically alter production of fat and protein. Milk fat depression can be alleviated within seven to 21 days by changing the diet. Milk protein changes may take three to six weeks or longer if the problem has been going on for a prolonged period. Nutrition or ration formulation changes are more strongly correlated to milk fat content than milk protein. Milk fat can be changed by 0.1 to 1.0 percentage points, while protein is seldom altered more than 0.1 to 0.4 points by nutritional changes. For these reasons, nutrition and feeding management are considered the best solutions to a milk fat or protein problem other than genetics.

MAINTAINING COMPONENT LEVELS

Recommendations for normal fat and protein content can be achieved by feeding a balanced ration that meets the chemical and physical needs of the cow. Key management practices to accomplish this goal include: regular forage tests for energy, minerals and protein; regular tests of TMR and concentrates to see if they meet herd requirements; evaluation of forage and TMR particle size; use of production records to track component yields; and use of body condition scoring to evaluate the success of nutritional programs.

Monitor milk component percentages from your milk handler or DHI records by month. Over time this will allow you to develop a normal range. If components suddenly drop out of their normal range, investigate and find the cause. Paying close attention to component levels may also allow you to make nutritional changes in response to market conditions. Any decisions of this kind should be analyzed to determine the additional cost compared to the additional revenue.

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http://extension.psu.edu/animals/dairy/business-management/financial-tools/dairy-sense

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