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Dairy Lines

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Upcoming Events

Garden City Dairy Seminar
March 28
Garden City, Kan.

Spring Fair Dairy Show
March 23-25
Oklahoma City, Okla.

Holstein Southern National & Holstein Show and Sale
April 9-14
Payne County Expo Center
Stillwater, Okla.

DAIRY RESEARCH & EXTENSION NEWS
http://www.oznet.ksu.edu/ansi/nletter/dairylin.htm

Managing Milk Composition: Normal Sources of Variation

This article is part of a fact sheet series produced by Extension Dairy Specialists from Oklahoma, Texas and New Mexico.

Many factors influence the composition of milk, the major components of which are water, fat, protein, lactose and minerals. Nutrition or dietary influences readily alter fat concentration and milk protein concentration. Fat concentration is the most sensitive to dietary changes and can vary over a range of nearly 3.0 percentage units. Dietary manipulation results in milk protein concentration changing approximately 0.60 percentage units. The concentrations of lactose and minerals, the other solids constituents of milk, do not respond predictably to adjustments in diet.

Milk composition and component yields also can be affected by genetics and environment, level of milk production, stage of lactation, disease (mastitis), season, and age of cow.

Normal Sources of Variation in Composition

Genetics and Environment: Table 1 contains the breed averages for percentage of milk fat, total protein, true protein and total solids. A change in milk composition using traditional breeding techniques occurs slowly, although new techniques of genetic manipulation may allow faster progress in the future. Yields of milk, fat, protein and total solids are not easily impacted by genetics; heritability estimates for yield are relatively low at about 0.25. Meanwhile, heritability estimates for milk composition are fairly high at 0.50. Conversely, environmental factors such as nutrition and feeding management will impact yield more than the actual percent composition of the major milk constituents.

The priority placed on each genetic trait depends upon its economic or profit impact. Milk yield per cow tends to receive the most attention by producers. However, component yields should not to be overlooked. Genetic selection should be directed toward increasing fat, protein and nonfat solids yields. But, because component percentages tend to have negative genetic associations with yield traits, a

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Table 1. Breed averages for percentages of milk fat, total protein, true protein and total solids.

	Percent			
Breed	Total Fat	True Protein	Total Protein	Solids
Ayrshire	3.88	3.31	3.12	12.69
Brown Swiss	3.98	3.52	3.33	12.64
Guernsey	4.46	3.47	3.28	13.76
Holstein	3.64	3.16	2.97	12.24
Jersey	4.64	3.73	3.54	14.04
Milking Shorthorn	3.59	3.26	3.07	12.46

Heart of America Dairy Herd Improvement Summary (Jan)

	Quartiles				Your Herd
	1	2	3	4	
Ayrshire					
Rolling Herd Average	18,478	16,035	14,462	12,524	
Summit Milk Yield 1st	59.0	57.0	52.0	21.0	
Summit Milk Yield 2nd	76.5	31.0	63.0	58.5	
Summit Milk Yield 3rd	80.0	36.0	70.0	28.5	
Summit Milk Yield Avg.	72.5	61.5	61.5	61.0	
Income/Feed Cost	1,245	837	840	868	
SCC Average	326	83.0	326	125	
Days to 1st Service	70	28	66	64	
Days Open	139	134	118	171	
Projected Calving Interval	13.8	13.6	13.1	14.8	
Brown Swiss					
Rolling Herd Average	20,309	16,891	15,360	13,161	
Summit Milk Yield 1st	65.1	55.7	52.0	45.7	
Summit Milk Yield 2nd	65.3	65.4	66.6	58.7	
Summit Milk Yield 3rd	85.3	75.1	69.3	66.0	
Summit Milk Yield Avg.	76.1	65.5	63.0	55.2	
Income/Feed Cost	1,726	1,186	1,000	852	
SCC Average	473	384	307	394	
Days to 1st Service	90	52	95	48	
Days Open	169	152	148	197	
Projected Calving Interval	14.7	14.2	14.0	15.7	
Guernsey					
Rolling Herd Average	15,772	14,586	13,606	12,783	
Summit Milk Yield 1st	27.5	52.5	49.0	46.6	
Summit Milk Yield 2nd	73.0	60.0	57.5	62.0	
Summit Milk Yield 3rd	68.5	64.5	61.5	61.6	
Summit Milk Yield Avg.	66.0	60.5	54.0	55.6	
Income/Feed Cost	1,259	1,198	852	730	
SCC Average	108	227	184	499	
Days to 1st Service	84	80	98	114	
Days Open	250	158	157	252	
Projected Calving Interval	17.5	14.4	14.4	17.5	
Holstein					
Rolling Herd Average	23,350	20,411	18,175	14,879	
Summit Milk Yield 1st	73.1	66.6	60.8	52.4	
Summit Milk Yield 2nd	92.3	83.2	75.2	62.8	
Summit Milk Yield 3rd	97.8	88.7	80.1	68.2	
Summit Milk Yield Avg.	86.4	79.1	72.4	62.6	
Income/Feed Cost	1,636	1,359	1,175	847	
SCC Average	368	379	407	522	
Days to 1st Service	91	92	91	89	
Days Open	162	167	177	197	
Projected Calving Interval	14.5	14.7	15.0	15.6	
Jersey					
Rolling Herd Average	17,349	15,110	13,771	11,867	
Summit Milk Yield 1st	54.7	49.4	44.7	42.0	
Summit Milk Yield 2nd	65.4	65.2	58.1	52.0	
Summit Milk Yield 3rd	69.7	65.4	58.8	53.2	
Summit Milk Yield Avg.	63.5	59.7	54.6	48.9	
Income/Feed Cost	1,461	1,336	1,138	842	
SCC Average	270	343	411	407	
Days to 1st Service	75	89	76	90	
Days Open	138	155	137	140	
Projected Calving Interval	13.7	14.3	13.7	13.8	
Milking Shorthorn					
Rolling Herd Average	17,620	15,067	14,704	11,924	
Summit Milk Yield 1st	50.0	55.0	50.0	54.0	
Summit Milk Yield 2nd	66.0	72.0	61.5	30.0	
Summit Milk Yield 3rd	74.0	75.0	66.0	63.5	
Summit Milk Yield Avg.	67.0	69.0	59.5	60.5	
Income/Feed Cost	—	1,182	975	951	
SCC Average	230	239	302	199	
Days to 1st Service	0	42	92.5	56.5	
Days Open	178	199	169	130	
Projected Calving Interval	15.1	15.7	14.8	13.5	

Hay Prices*—Kansas

	Location	Quality	Price ($/ton)
Alfalfa	Southwestern Kansas	Supreme	110-120
Alfalfa	Southwestern Kansas	Premium	100-110
Alfalfa	Southwestern Kansas	Good	—
Alfalfa	South Central Kansas	Supreme	100-110
Alfalfa	South Central Kansas	Premium	100
Alfalfa	South Central Kansas	Good	—
Alfalfa	Southeastern Kansas	Supreme	—
Alfalfa	Southeastern Kansas	Premium	90-105
Alfalfa	Southeastern Kansas	Good	—
Alfalfa	Northwestern Kansas	Supreme	100-105
Alfalfa	Northwestern Kansas	Premium	90-100
Alfalfa	Northwestern Kansas	Good	—
Alfalfa	North Central/East Kansas	Supreme	50-58cents/pt
Alfalfa	North Central/East Kansas	Premium	90-105
Alfalfa	North Central/East Kansas	Good	—

Supreme = over 180 RFV (less than 27 ADF)
Premium = 150–180 RFV (27–30 ADF)
Good = 125–150 RFV (30–32 ADF)

Source: USDA Kansas Hay Market Report, *February 10, 2001.*

Hay Prices—Oklahoma

	Location	Quality	Price ($/ton)
Alfalfa	Central/Western, OK	Premium	95-120
Alfalfa	Central/Western, OK	Good	85-105
Alfalfa	Panhandle, OK	Premium	95-110
Alfalfa	Panhandle, OK	Good	90-105

Source: Oklahoma Department of Agriculture, *February 8, 2001.*

Feed Stuffs Prices

	Location	Price ($/ton)
Blood Meal	Central US	421
Corn Gluten Feed	Kansas City	85-87
Corn Gluten Meal	Kansas City	182
Corn Hominy	Kansas City	68
Cotton Seed Meal	Kansas City	180
Whole Cotton Seed	Memphis	120
Distillers Grains	Central Illinois	100-110
Pork—Meat and Bone Meal	Texas Panhandle	—
SBM 48%	Kansas City	163-173
Sunflower Meal		110
Wheat Middlings	Kansas City	61-63

Source: USDA Feedstuff Market Review, *February 7, 2001.*

Garden City Dairy Seminar set for March 28.

The Garden City Dairy Seminar will take place March 28 at the Plaza Hotel in Garden City, Kan.

Forage Quality Boom or Bust is the theme of this year's program, which begins at 4 p.m. Featured speakers are K-State Research and Extension Dairy Specialist Mike Brouk and Bill Mahonna of Pioneer Hi-Bred.

Dinner will be served at 6 p.m. and is sponsored by Miguel Dairy Service and High Plains Dairy Construction. The program concludes at 8:30 p.m.

Please RSVP by calling Tamie at 785-532-1280.

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Table 2. Change in milk constituents associated with elevated somatic cell counts.

Constituent	Normal Milk	High SCC Milk	Percent of Normal
		%	
Milk nonfat solids	8.9	8.8	99
Fat	3.5	3.2	91
Lactose	4.9	4.4	90
Total protein	3.61	3.56	99
Total casein	2.8	2.3	82
Whey protein	0.8	1.3	162
Sodium	0.057	0.105	184
Chloride	0.091	0.147	161
Potassium	0.173	0.157	91
Calcium	0.12	0.04	33

Adapted from Harmon, 1994. J. Dairy Science 77:2103

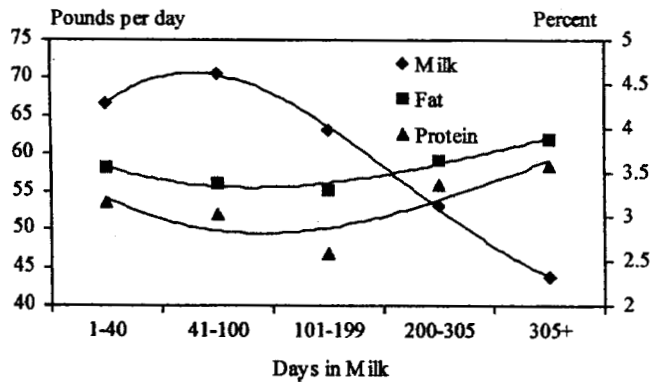
change in these percentages is not likely to be achieved through genetic selection alone.

Level of Production: Yields of fat, protein, nonfat solids and total solids are highly and positively correlated with milk yield. Under selection programs that emphasize milk yield, fat and protein yields also increase. However, the percentages of fat and protein in the total composition decrease.

The concept of milk component yield versus milk composition can be illustrated by comparing different bulk tank production averages with similar protein composition. If the tank average increases from 65 pounds to 70 pounds while protein composition remains constant at 3.1 percent, an additional 0.16 pound of protein is produced per cow per day. However, if the percentage of protein increases from 3.1 to 3.2 percent while the bulk tank average production remains at 65 pounds, protein production (yield) increases by only 0.07 pound per cow per day.

Stage of Lactation: The concentration of milk fat and protein is highest in early and late lactation and lowest during peak milk production through mid-lactation (Fig. 1). Normally, an increase in milk yield is followed by a decrease in the percentages of milk fat and protein while the yields of these constituents remain unchanged or increase.

Figure 1. Milk, fat and protein by stage of lactation for New Mexico, Oklahoma and Texas Holstein herds on DHIA.

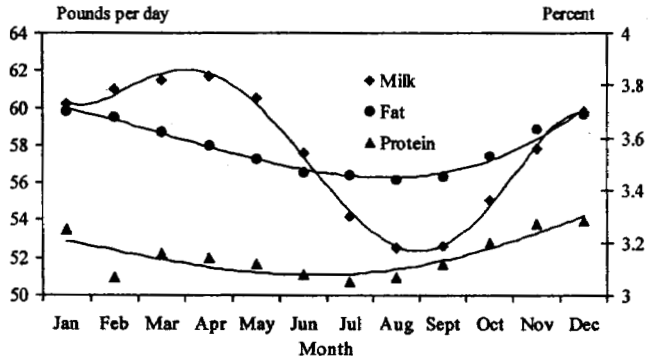


(Source: DRMS, Raleigh, NC)

Disease: Although other diseases can affect milk component content and distribution, mastitis has been the predominate disease studied. Table 2 shows the compositional changes in milk constituents associated with elevated somatic cell counts (a measure of severity of the disease). Mastitis results in a reduction in fat and casein content and an increase in whey content of milk. These changes in the milk proteins, in conjunction with alterations in lactose, mineral content and milk pH, result in lower cheese yields and altered manufacturing properties. Milk from cows with elevated somatic cell counts (greater than 500,000 somatic cells/ml) has longer coagulation time and forms weaker curds than milk from cows with lower somatic cell counts.

Season: Milk fat and protein percentages are highest during the fall and winter and lowest during the spring and summer (Fig. 2). This variation is related to changes in both the types of feed available and climatic conditions. Lush spring pastures low in fiber depress milk fat. Hot weather and high humidity decrease dry matter intake and increase feed sorting, resulting in lower forage and fiber intake.

Figure 2. Monthly change in milk production and composition for New Mexico, Oklahoma and Texas Holstein herds on DHIA.



(Source: DRMS, Raleigh, NC)

Age (Parity): While milk fat content remains relatively constant, milk protein content gradually decreases with advancing age. A survey of Holstein DHIA (Dairy Herd Improvement Association) lactation records indicates that milk protein content typically decreases 0.10 to 0.15 units over a period of five or more lactations or approximately 0.02 to 0.05 units per lactation.

Summary

Many factors besides nutrition management can influence milk composition. This is an important point to remember when evaluating the potential to improve a herd's milk composition and component yields. Certainly, genetics plays an important role, but changes here are slow. Producers who pay attention to detail, keep disease to a minimum and adjust their management program as the seasons dictate will be in the best position to take advantage of nutrition management changes to alter milk composition and improve their bottom line.

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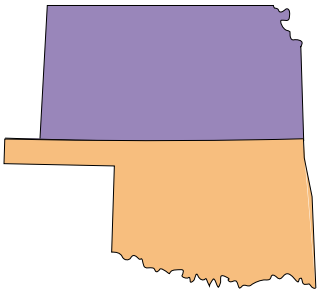

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