Dairy Management Column

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Vitamin E, Selenium and Milk Quality

Normal body processes, environmental insults (such as mycotoxins, nitrates, solar radiation) and inflammatory conditions all produce "free radicals," a reactive oxygen species in the body's metabolism. The body defends itself against these assaults with its so-called antioxidant system. The system consists of three powerful enzymes, which contain copper, zinc, manganese, selenium and iron elements, plus vitamin E and carotene; their function is to convert free radicals to water and break fatty acid peroxidation chain reactions. Vitamin E and selenium have been found to be most effective in this process.

When pathogens invade the mammary gland, white blood cells (neutrophils) swarm to the infection site, trying to engulf (phagocytosis) and kill the bacteria with a chemical reaction. This reaction produces a high concentration of free radicals. While it helps kill the bacteria, it also can damage and kill the neutrophils. As part of the inflammatory response, other white blood cells (macrophages) also move to the infection site to kill bacteria and produce antibodies against them.

Vitamin E supplementation in research with dairy cows has consistently improved the function of neutrophils. Cows during the time before and after calving have a depressed immune system, making them extremely susceptible to intramammary gland infection. During this time, cows are also low in plasma vitamin E levels. Vitamin E supplementation eliminates the depression of neutrophil function during the time before and after calving.

Daily selenium supplementation at 0.1 ppm also has improved neutrophil function. Neutrophils from cows supplemented with 0.3 ppm selenium during the dry period and first 30 days of lactation had a greater killing ability against E. coli and S. aureus bacteria, some of the major mammary gland pathogens. Vitamin E feeding at 1,000 international units (IU)/day reduced the incidence and duration of mastitus, but the largest response came from the combination of selenium and vitamin E supplementation. Infections were reduced by 42 percent and clinical mastitis by 32 percent, especially the first three months of lactation. In Ohio studies, when 4,000 IU vitamin E/day were fed with adequate selenium, the reduction of clinical mastitis was 80 percent.

It has also been found that plasma selenium levels have a significant negative correlation with bulk tank somatic cell counts and that vitamin E plus selenium supplementation reduce the number of cows with elevated somatic cell counts above 200,000 by 70 percent. When cows had blood plasma levels of less than 3 microgram vitamin E/milliliter, their likelihood of having clinical mastitis was nine times greater than when the level was above three micrograms. Finally, vitamin E supplementation increased the vitamin E content of colostrum and, thereby, calf health.

Blood plasma levels of selenium and vitamin E are reliable indicators of the status of cows. Based on a reduction of retained placenta and mammary gland health, it has been recommended that selenium levels should be more than 0.075 microgram/milliliter blood serum or more than 0.20 microgram-/milliliter of whole blood. Vitamin E levels of cows at calving should be at least 3.5 microgram/millliliter blood plasma. Calves, heifers, and lactating and dry cows should be fed a supplement daily of 0.3 ppm selenium, especially where the soils are deficient. Additional 50 milligram injections three weeks before calving may also help.

Most concentrate feeds are low in vitamin E. Raw soybeans are a good source, but roasting destroys most of it. Fresh green forage is a good source with about 100 IU/pound of dry matter. Hays and silages have very little vitamin E. Dry cows should be supplemented with 1,000 IU vitamin E/day, and lactating cows with at least 500 IU. The cost may be $0.02/cow/day, compared with the great potential benefit.

Mastitis is still a costly disease in the United States. Veterinary and drug costs, lost production and dumped milk have been estimated on average at a 100-cow herd for clinical and subclinical cases combined—about $17,500/year. Thus, the economic benefit from vitamin E plus selenium supplementation can be significant, especially in the current milk price squeeze situation.

In principal, the benefits of selenium and vitamin E supplementation also apply to dairy goats and dairy sheep. Vitamin E and selenium supplementation also improves milk quality for human consumption and reduces oxidative flavor problems, an added, but not unimportant benefit.

$450,000 In Gifts

UNIVERSITY PARK (Centre Co.) — Six gifts totaling $450,000 have bolstered Penn State's plans to build a new food sciences building at the University Park campus.

The new facility, to be built with a combination of state and private funds, will help the Department of Food Science better serve Pennsylvania's food processing and manufacturing industry, which includes more than 2,300 companies employing 90,000 workers.

Making commitments for the new building were:

• Del Grosso Foods, Tipton. Founded by Ferdinand J. and Mafalda M. Del Grosso in 1946 when they began to sell their family's pasta sauce, Del Grosso Foods now sells 3 million cases of tomato-based sauces and plans to expand into frozen foods.

• Roger and Barbara Claypoole, of Worthington. Roger Claypoole is the general partner of Creekside Mushrooms Limited, grower and marketer of Moonlight Mushrooms. He earned bachelor's and master's degrees in agriculture from Penn State in 1970 and 1971, respectively. The gift was made in memory of his father, Henry W. Claypoole, and uncle, Harold M. Claypoole, Penn State alumni.

• Wenger's Feed Mill Inc., Rheems, a producer of poultry and swine feeds. Founded in 1944 by Melvin M. Wenger, the organization operates a network of feed mills located in Pennsylvania and neighboring states.

• Horace Woodward, Mendenhall. Woodward recently retired from farming, having raised poultry, dairy cattle, and fruit on a farm that has been in the Woodward family since 1906. He is a 1928 Penn State graduate in agriculture.

• Carol Thoele-Williams and Richard C. Williams in memory of their father, Dr. Howard W. Thoele, former professor of dairy science and senior associate dean emeritus of the College of Agricultural Sciences.

• Barry and Rosemary Zoumas, State College. Barry Zoumas is the Alan R. Warehime Professor in the College of Agricultural Sciences. Formerly vice president for science and technology at Hershey Foods, he has master's and doctoral degrees in nutrition from Penn State.

Lowest SCC Lancaster DHIA Herds For May

The lowest rolling SCC herds in Lancaster DHIA as of the month of May are as follows:

NAME	TOWN	BREED	RHA SCC	#COWS
ADAMS COUNTY				
JOBO HOLSTEIN FARM	GETTYSBURG	B	127	24
BERKS COUNTY				
OSCAR & MARIE SIPLER IV	SHOEMAKERSVILLE	H	168	11
RALPH E MOYER	MYERSTOWN	H	171	105
LAWRENCE GOOD	WOMELSDORF	H	181	78
CHESTER COUNTY				
CHRIST S FISHER	HONEY BROOK	H	175	44
JOHN S FISHER	OXFORD	H	180	50
CUMBERLAND COUNTY				
ROBERT E KEEFER	SHIPPENSBURG	H	190	341
ELI H WEAVER	NEWBURG	H	197	45
DAUPHIN COUNTY				
BEN.M.KING	LYKENS	H	143	48
SYLVAN S STOLTZFUS	LYKENS	H	172	47
ELMER M KING	LYKENS	H	192	45
DAVID K. KING	LYKENS	H	196	40
FRANKLIN COUNTY				
RODNEY STUFF	MERCERSBURG	G	163	17
LANCASTER COUNTY				
GARY & JENNY BOWMAN	QUARRYVILLE	H	76	70
MARVIN E ZIMMERMAN	EAST EARL	H	87	34
DANIEL F BEILER	DRUMORE	H	91	49
JAY &JOANNE WISE	STEVENS	H	93	64
DANIEL B LANDIS	LANCASTER	H	108	78
CHRIST K STOLTZFUS	LEOLA	H	125	43
JAMES & SHARON NICKLE	NOTTINGHAM	H	127	52
IRA M HEISTAND JR	ELIZABETHTOWN	H	128	62
MOUNT VIEW ACRES	EPHRATA	H	128	49
JEFFREY L AUNGST	ELIZABETHTOWN	H	129	42
SAMUEL F LONG	PEACH BOTTOM	X	133	12
CHRIST K ESH	KIRKWOOD	H	137	27
LEONARD J STOLTZFUS	GAP	H	139	54
SAMUEL F LONG	PEACH BOTTOM	H	142	41
CARL E & NANCY G BRANDT	MANHEIM	H	145	74
DAVID K STOLTZFUS	PEACH BOTTOM	H	145	53
JOSEPH N ZEISET	NARVON	H	146	20
ROY E SENSENIG	NOTTINGHAM	H	150	71
CLAY FARM	LITITZ	H	152	63
JOHN H HOWARD	WILLOW STREET	H	152	39
ARLIN BENNER	MOUNT JOY	H	154	168
STEVE K BEILER	HOLTWOOD	H	155	49
SAMUEL J ZOOK	BIRD-IN-HAND	H	155	41
MAR MULLDALE FARM	QUARRYVILLE	H	160	140
DANIEL M STOLTZFUS	MORGANTOWN	H	160	56
TRITOWN FARM	LEOLA	H	163	33
RALEIGH D RHODES III	QUARRYVILLE	H	163	41
MERVIN M ESH	BIRD-IN-HAND	H	163	36
DAN S STOLTZFUS	RONKS	H	167	41
LESTER W GEHMAN JR	EPHRATA	H	168	60
NICE VIEW FARM	EPHRATA	H	169	56
PAUL B ZIMMERMAN JR.	EPHRATA	H	171	57
GORDON & CAROLE HOOVER	GAP	H	171	112
STEVEN M HERR	NEW PROVIDENCE	H	171	76
HENRY L. GLICK	LANCASTER	H	171	47
ABNER S. KING	TALMAGE	H	175	28
BEL-RIDGE FARM	PARADISE, PA.	H	177	44
REUBEN S STOLTZFUS	NARVON	H	178	51
STEVE STRICKLAND	BAINBRIDGE	H	178	116
HARVEY Z RINGLER	NARVON	H	179	43
NORMAN S WENGER JR	NEW HOLLAND	H	180	53
SAMUEL K GLICK	QUARRYVILLE	H	183	38
JAMES SENSENIG	QUARRYVILLE	H	183	66
MARVIN Z WEAVER	LITITZ	H	185	30
J DAVID HOSTETTER	NEW HOLLAND	X	185	51
J. KENNETH GROFF	LEOLA	H	186	60
AARON R ZEISET	LEOLA	H	190	43
KENTON L SWEIGART	MOUNT JOY	H	190	72
SAMUEL S STOLTZFUS	BIRD IN HAND	H	190	43
PIN-OAK FARM	STRASBURG	H	190	46
MARLIN W. HORST	KINZERS	H	190	59
EUGENE & SUSAN HESS	MARIETTA	H	191	68
BO JOY FARM	QUARRYVILLE	B	193	54
HENRY F STOLTZFUS JR	LITITZ	H	193	47
AMOS MARTIN	HOLTWOOD	H	193	59
MARTIN BROTHERS	HOLTWOOD	H	194	73
MEADOW VISTA FARM	BAINBRIDGE	H	194	205
LEE NOME FARM	GORDONVILLE	H	195	32
ABRAHAM SHELLY JR	MANHEIM	H	195	30
LEBANON COUNTY				
ADAM & LISA SONNEN	RICHLAND	H	193	66
LYCOMING COUNTY				
SCOTT &RHONDA LOVELL	LINDEN	H	84	52
NORTHUMBERLAND				
PHILLIP NEWSWANGER	DANVILLE	H	182	44
SNYDER COUNTY				
CARL EWING	MCCLURE	H	194	59
SOMERSET COUNTY				
MARK & HELEN MISHLER	HOLSOPPLE	H	82	44
J & M FARMS	WINDBER	H	150	45
CLARADALE FARMS	SALISBURY	H	154	69
ERNEST SLABAUGH	MEYERSDALE	G	190	18
MENNO & FANNIE ZOOK	MEYERSDALE	H	192	28
HICKORY BOTTOM #	BERLIN	X	198	27
MILLER BROTHERS	BOSWELL	H	198	204
UNION COUNTY				
AARON B MARTIN	MIFFLINBURG	H	170	47
ELTON W NOLT	LEWISBURG	H	181	41
STATE OF MARYLAND				
ENGLAND FARM INC.	RISING SUN	H	113	63