

NUTRITION PLUS

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AVOIDING NUTRITIONAL BUTTERFAT DEPRESSION

Continuing changes in the economic landscape of dairy feedstuff selection may be challenging some producers in the fat-test department. Use of full-fat soybeans, wider availability of distillers grains, adaptation of newly approved monensin into milking rations, and incorporation of grazing and fresh forages all bring a potential for nasty surprises in the component check. Researchers are demonstrating that at the heart of the problem often lie ration components that, under the right conditions in the rumen, can signal an abrupt reduction in fat production in the mammary gland.

LIKE PROTEIN, FAT IS COMPLEX

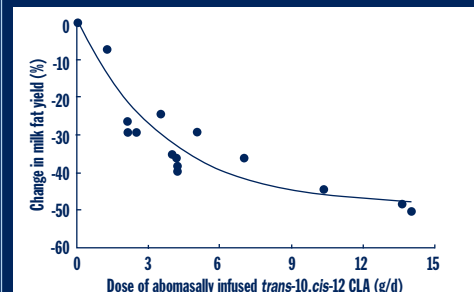
Just as we have abandoned ration formulation based on crude protein in favor of the more accurate amino-acid requirements, says Cornell dairy scientist Dr. Dale Bauman, we now are beginning to understand it's necessary to likewise break down ration fat into its different fatty acids, to better understand and then meet the cow's fat requirements.

Dr. Bauman suggests the evidence to blame milkfat depression on a shift in the composition of fatty acids is much stronger than some of the other pet theories like insufficient acetate and insulin deficiency. In dairy rations, cows normally receive linoleic acid from seeds and oils and linolenic acid from forages. They are necessary to normal body function—particularly reproductive performance—once they reach the lower digestive tract. However, both fatty acids in free form are nevertheless toxic to some species of bacteria in the rumen. To compensate, the rumination process rapidly converts those free unsaturated fatty acids into saturated fatty acids by changing the arrangement of the toxic double carbon

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WHAT HAPPENS?

According to the “biohydrogenation” theory of Dr. Bauman and colleague Dr. J. Mikko Grinari, the rumen deals with toxic unsaturated free fatty acids like linoleic acid by breaking the double carbon bonds through a process that first converts it into conjugated linoleic acid of the *cis-9, trans-11* configuration—and then eventually to stearic acid. However, when the rumen is too acidotic because of typical factors known to contribute to reduced butterfat—like insufficient effective fiber, excessive ruminally fermentable carbohydrate, sorting and slug feeding—part of that linoleic acid is diverted into a different form: conjugated linoleic acid of the *trans-10, cis-12* variety. As little as 0.05 ounces of *trans-10, cis-12* escaping the rumen can depress milkfat synthesis in the mammary gland.



BASED ON RESULTS FROM SEVEN PUBLISHED STUDIES.

SOURCE: DE VETH MJ, GRINARI JM, PFEIFFER AM, BAUMAN DE. EFFECT OF CLA ON MILK FAT SYNTHESIS IN DAIRY COWS: COMPARISON OF INHIBITION BY METHYL ESTERS AND FREE FATTY ACIDS, AND RELATIONSHIPS AMONG STUDIES. LIPIDS 2004 39(4):365-372.

CONSULTANT'S CORNER

STILL...THE BASICS COUNT

Rick Barham, McMinn/Loudon Farmers Co-op, Athens, Tenn.

A feedstuffs-related imbalance in fatty acids is an attractive explanation for butterfat depression, because it can help nutritionists explain how two seemingly identical herds can be fed distillers grains and one have great luck while the other turns into a disaster.

At the same time, in my experience, when you encounter a client experiencing disappointing fat tests, there's a lot of room to revisit the basics of butterfat manipulation through nutrition and management:

DIAGNOSE ACCURATELY. Pounds of fat—and protein and milk, for that matter—sold per cow will give you a more accurate picture than DHI herd averages, which can be confounded by factors like high cull rates. And remember, fat test results usually only give you valuable information inside the confines of the individual dairy—not from farm to farm.

ANALYZE FORAGE FIRST. As the more variable half of the ration and subject to energy fluctuations based on growing conditions, forages should get attention first. Six to eight samples composited and checked for—at least—moisture, crude protein, NDF, NDICP, ash and fat will benchmark non-fiber carbohydrate levels. From that benchmark, they can be more accurately tweaked based on fat tests and signs of acidosis.

IT'S STILL ALL ABOUT EFFECTIVE FIBER. A healthy rumen goes a long way toward stable component production, and in that sense, feedstuff selection and incorporation still starts with liberal use of your Penn State particle separator. This is going to become even more critical as the industry deals with the high interest I'm experiencing about adding monensin to rations—and the risk for butterfat depression that addition can bring.

Shake samples as they're delivered and again just before feeding to evaluate sorting. We follow the guidelines for optimal intake and fermentation of 10 to 15 percent in the top box, 40 to 50 percent in the second, 30 to 35 percent in the third, and 10 to 20 percent in the bottom box. And don't neglect refusals. We like to aim for

around 2 to 4 percent of the initial DMI calculation as weigh back, and then make sure your shaken samples are within 10 percent, plus or minus, of the initial reading for each box.

And even if forage particle size is appropriate, it behooves you to check the feed crews' operating procedure. Neglecting mixing times on mixing wagons, for instance, can make a huge impact on final particle size and resulting effective fiber. Put it all in context of the animals' daily routine, as well. Is concentrate fed on an empty rumen, for example? That small change in timing can make a big impact—all else being equal. Always take a minute during farm visits to confirm at least half of cows are chewing.

CONDITION SCORE. I'm surprised to find a number of nutritionists who still don't take advantage of this indispensable diagnostic for clients. Gauging the percentage of over-fat cows can tell you a lot—right off the bat.

CHECK BUFFER USE. Buffers can be a useful tool to raise milkfat percent, but they shouldn't be a routine or a first resort.

DON'T FORGET NON-NUTRITIONAL FACTORS. Has the processor made any changes in testing protocols? Can you correlate fat test reductions to different crews or employee changes that might signal procedural errors—like over-rinsing lines and diluting components? Leaking plate coolers? New milk haulers who don't agitate long enough before sampling?

SOYPLUS® FOR DEPENDABLE ENERGY AND PROTEIN SUPPLEMENTATION

Dairy producers who attempt to take advantage of alternative commodities like distillers grains without accounting for their relatively high level of polyunsaturated fats, their high levels of non-effective NDF and their relatively low level of lysine as a percent of undegradable protein may end up reducing butterfat tests, as well as milk production. Any money clients save on this apparently cheap commodity can be readily lost through reduced milk production and quality.

SoyPLUS has a 5 percent oil content. About 32 percent of this oil is protected from degradation in the rumen. The oil in SoyPLUS contains more than 50 percent linoleic acid (C18:2), a fatty acid precursor to reproductive hormones and thus shown to be beneficial to reproduction efficiency. At the same time, SoyPLUS provides an excellent source of lysine—6.24 percent of the crude protein vs. dried distillers grains' low 2.24 percent of crude protein.

SoyPLUS offers a dependable source of important fatty acids producers can trust to be consistent with each batch, as well as no compromise in supplying protected lysine to the lower digestive tract.

BEYOND BYPASS

BYPASS PROTEIN WITH NO FAT PENALTY

Selecting a good source of bypass amino acids while avoiding nature's production penalty imposed by fatty acid rumen metabolism remains difficult when using sources like distillers grains and roasted whole soybeans. As the Cornell researchers demonstrate, when those feedstuffs—which contribute to already high levels of polyunsaturated fatty acids present in dairy-ration grains and forages—create even a small increase in C18:1 T fatty acids in the rumen, an acidotic rumen can fail to saturate those fatty acids. Once those polyunsaturated fatty acids escape the rumen, they contribute to butterfat suppression in the mammary gland.

WEST CENTRAL HAPPENINGS

Members of West Central's SoyPOWER® biodiesel sales force and the Renewable Energy Group team helped members of Canada's fledgling biodiesel market envision the importance of biodiesel at the first Canadian Renewable Fuels Summit, in Toronto on Dec. 7.

While the Canadian biodiesel market isn't as mature as the established U.S. market, Ontario joined two other provinces in implementing its own 10 percent province-wide

FROM THE MATERNITY PEN

EXPANDING SUPP

Since West Central first developed SoyChlor® in 1998 based on research presented in publications by Drs. Ron Horst and Jesse Goff of the USDA National Animal Disease Center, SoyChlor has been through several generations to make it the most effective and most palatable transition dairy cow supplement available. The patented, proprietary process West Central scientists perfected overcame the challenges of incorporating hydrochloric acid onto feed ingredients. The result: A high-chloride product, able to dependably mobilize calcium around calving time.

Over those six years, customers have rewarded our innovation by increasing demand so fast it has outpaced the capabilities of our Adair, Iowa plant, where we have produced

QUALITY CORNER

In contrast, SoyPLUS provides an excellent source of bypass amino acids while avoiding significant quantities of the C18:1 T fatty acids. All-natural SoyPLUS is manufactured using a combination of heat and pressure to remove as much oil as possible, without resorting to using hexane or other chemicals. That process leaves the remaining fat an integral part of SoyPLUS, avoiding the risk free oil can bring. The fat in SoyPLUS—around 30 percent bypass—supplies beneficial linoleic and linolenic long-chain fatty acids to the small intestine.

The 7 percent fat on a dry-matter basis in SoyPLUS allows you to reduce the amount of supplemental fat needed, lowering ration costs by 2 to 5 cents per head per day when compared to the low fat “treated” bypass soybean meals.

renewable fuels mandates.

West Central SoyPOWER salesman Don Irmen and REG sales/production manager Myron Danzer demonstrated to summit attendees the benefits of biodiesel and the role SoyPOWER has played in establishing and growing the biodiesel market in the United States. Danzer explained how REG helps groups enter the biodiesel industry by planning and building turnkey production facilities, as well as marketing biodiesel products.

ARE THE RECORD HIGH SOYBEAN YIELDS OF 2004 AFFECTING THE PROTEIN CONTENT OF SOYPLUS?

Our producers did experience very high yields. The initial indication is the Fall 2004 soybean crop from west central Iowa contains normal levels of protein and fat and will yield SoyPLUS with a relatively high protein content.

The production of SoyPLUS includes a stringent quality-control program. In addition to our continuous monitoring using an in-house NIR, we send check samples to an independent laboratory in Des Moines. Results for mid June to mid September 2004, the last of the 2003 crop, are shown below.

	Percent	Standard Deviation
Dry Matter (N=19)	88.76	0.77
Crude Protein (N=19)	43.60	1.10
Crude Fat (N=19)	6.05	0.48
ADF (N=14)	7.30	0.55
NDF (N=14)	15.44	1.18
ADICP (N=14)	2.72	0.21
NDICP (N=14)	7.30	0.82

Results from October 7 - December 7, 2004 include:

	Percent	Standard Deviation
Dry Matter (N=19)	88.77	0.72
Crude Protein (N=19)	43.65	0.70
Crude Fat (N=19)	5.86	0.48

LY OF HIGH-QUALITY CHLORIDE

SoyChlor since 1998.

Now, demonstrating our continuing commitment to delivering innovation in transition cow management for the future, West Central has opened a new SoyChlor plant in Jefferson, Iowa, to meet that increasing demand. The state-of-the-art facility incorporates the engineering expertise of plant-designer Todd and Seargent with the production knowledge of West Central’s scientists, feed mill managers and production personnel. Process improvements will speed and improve the uniformity of drying in SoyChlor,

even while we use the same high quality ingredients, backed by West Central’s continued commitment to deliver a palatable source of chloride using base ingredients low sodium and potassium.

All of us at West Central would like to take this opportunity to thank the equipment manufacturers, practicing nutritionists, researchers, and feed consultants who lent us their advice and expertise in developing our new facilities.

SOURCE: GOFF JP AND HORST RL. 1998. USE OF HYDROCHLORIC ACID AS A SOURCE OF ANIONS FOR PREVENTION OF MILK FEVER. J DAIRY SCI. NOV;81(11):2874-80.





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IN THIS ISSUE

- Ration fatty acid implications have grown as complex as protein formulation. Consider these points to avoid butterfat issues.
- One dairy consultant's advice: Don't forget the basics when helping clients with butterfat depression.
- New SoyChlor facility opening
- Dependable bypass protein, without the fat penalties

AVOIDING NUTRITIONAL BUTTERFAT DEPRESSION

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bonds. Under some conditions, the rumen “conjugates” those fatty acids into intermediate forms that decrease fat production once they reach the mammary tissue. Work by Dr. Bauman and others at Cornell has shown that infusing as little as 0.05 to 0.07 ounces of one—labeled “*trans-10 cis-12*” conjugated linoleic acid—into the abomasum of test cows caused them to produce from 25 to 40 percent less milkfat.

This fatty-acid/butterfat connection means nutritionists must give close attention to fat supplementation and how it's complicated by the fatty acid composition of commodities. Recent surveys reported by University of Wisconsin's Robert Kaiser and Dr. Randy Shaver, for instance, demonstrate the fatty acid data for many feedstuffs included in the 2001 NRC may be out of date. Both corn hybrids and ethanol-production processes differ enough from those on which NRC is based, they say, that nutritionists shouldn't rely on book values. Their analyses of distillers grains submitted by four area ethanol plants found plant efficiencies are squeezing higher alcohol yields from grains and thus tending to concentrate all the remaining constituents of the feedstuff—particularly, in this case, ether extract—at the expense of starch.

FAT IMPLICATIONS

Based on their analyses of distillers grains and solubles from four area ethanol plants, University of Wisconsin's Dr. Randy Shaver and Bob Kaiser suggest these in-field implications:

- Fat content is likely higher than book values.
- The fat is high in C18:2 linoleic acid, the precursor to *trans-10 cis-12* conjugated linoleic acid.
- More fat exists in free-oil form. Ethanol production releases corn oil which may be hostile to the rumen.
- Distillers grains can vary widely in their nutrient composition. A survey of eight Northern Plains ethanol plants reported by University of Minnesota researchers in 1998 found ether extract as a percent of dry matter varied from 4.4 to 18.7 percent across and within the plants. ADF showed similar variation.