ilk fat depression can be a challenging issue in dairy herds. When approaching a potential herd problem with milk fat test, it is important to first define the problem carefully. Do not pursue milk fat test depression problems that are in fact not problems at all. At times it is surprisingly difficult to determine if a herd really has a low milk fat test. Normal milk fat percentage depends greatly on breed, season, and days in milk. Nutritional causes of milk fat depression only become a concern when these three major factors have already been checked and it has been determined that the problem is for real.

Milk fat test is normally about 0.25 percent lower in the summer than in the fall months. This effect is not completely understood, but could be mediated by increased risk for subacute ruminal acidosis (SARA).

Greater risk in summer

Cows are apparently at higher risk for SARA in the summer due to heat stress, which alters their acid-base balance and makes it difficult for them to maintain normal rumen buffering. Other causes of increased SARA in the summer months could include atypical meal patterns in response to heat avoidance and ration formulation errors made when nutritionists attempt to compensate for reduced dry matter intake during heat stress by decreasing dietary fiber. This only makes cow performance and milk fat test worse.

Breed also has a profound effect on milk fat percentage. Normal milk fat percentage for Holstein herds is between about 3.4 and 4.0 percent. Ayrshire and Milking Shorthorn herds have about the same milk fat percentage. Jersey cows have normal milk fat tests between about 4.2 and 5.0 percent. They exhibit the same seasonality of milk fat percentage as Holsteins do. Normal milk fat percentage for Brown Swiss herds is between about 3.6 and 4.2 percent; and for Guernsey herds it is between 4.0 and 4.8 percent.

Milk fat depression is broadly defined as milk fat test below 3.2 percent in Holstein, Ayrshire, and Milking Shorthorn herds, below 3.4 percent for Brown Swiss herds, below 4.0 percent for Guernsey herds, and below 4.2 percent in Jersey herds. Milk fat depression cannot be defined without knowing the days in milk of the cows being evaluated. Herds typically do not have a wide variation in days in milk unless they are seasonally calving. However, individual cows can have quite variable milk fat percentage due to days in milk alone. Days in milk can account for changes in milk fat percentage up to about 0.75 percent, with the lowest milk fat occurring around two months after calving.

Laboratory methods for milk fat testing are notoriously fallible. Most milk is tested for fat content by near infrared reflectance spectroscopy (NIRS). This test performs well compared to wet chemistry procedures (e.g., the Babcock test) when milk fat percentage is in the middle range. Thus, NIRS works well for bulk tank samples. However, it is not as accurate for very high or very low milk fat percentage in individual cows. It also may be affected by somatic cell count or other changes in milk properties.

Milk fat (the cream) rises to the top of a milk sample that has not been agitated or homogenized. This can cause error in any type of milk fat sampling. Bulk tanks must be agitated before sampling for milk fat percentage. Keep in mind that bulk tanks can be agitated too vigorously, which results butter formation within the tank. This could artificially lower milk fat percentage. Also, milk samples from individual cow samples must be shaken before testing in the lab.

Strip samples are worthless

Milk fat percentage also varies dramatically from the start to the end of milkout. Thus, milk samples from individual cows must be collected with a proportioning device that meters out a representative portion of the entire milking. Strip samples from cows have no value whatsoever for milk fat testing.

DHI milk fat tests for the entire herd are determined by testing milk fat percentage and milk volume from each cow. This is usually done for just

Update on milk fat depression in dairy herds

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Milk fat depression can be a challenging issue in dairy herds. When approaching a potential herd problem with milk fat test, it is important to first define the problem carefully. Do not pursue milk fat test depression problems that are in fact not problems at all. At times it is surprisingly difficult to determine if a herd really has a low milk fat test. Normal milk fat percentage depends greatly on breed, season, and days in milk. Nutritional causes of milk fat depression only become a concern when these three major factors have already been checked and it has been determined that the problem is for real.

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DHI milk fat tests for the entire herd are determined by testing milk fat percentage and milk volume from each cow. This is usually done for just
one daily milking, and only once a month. The milk fat test for the herd is then calculated by a weighted average of the milk fat and milk volume contribution from each cow. Milk fat percentages are adjusted for AM or PM milkings, since the AM milking typically has higher volume and lower milk fat percentage. However, these corrections are estimates only, and become even less accurate when cows are milked more than twice daily.

DHI milk fat test results are useful for looking at trends by days in milk and for variation in milk fat test, but they are not a particularly accurate measure of whole herd milk fat percentage. The milk fat test from the bulk tank is a much more accurate indication of whole herd milk fat percentage. Bulk tank milk fat percentages are also available on a daily or every other day basis. In contrast, DHI milk fat percentages usually represent only one milking per month.

Watch the proportion of low tests

Milk fat tests are typically interpreted as group or herd means. This is generally appropriate and is certainly convenient. However, group means may obscure “outlier” cows with very high or very low fat tests, and cyclic milk fat depression could be completely missed if individual cows within a group have milk fat depression at different or offsetting times. Thus, it can be helpful to interpret milk fat percentages as a proportion of cows with very high or very low test results.

Very low milk fat tests (under 2.5 percent for Holsteins) should not be present in more than about 10 percent of the cows tested on any single DHI test. Cows below 2.5 percent should typically only be between about 30 and 70 days in milk.

Milk fat to milk protein ratios are commonly used to evaluate milk fat depression. The often-accepted belief is that inversions of the milk fat: protein ratio (i.e., milk protein percentage is greater than milk fat percentage) is a better reflection of milk fat depression than the milk fat percentage alone. This concept is not supported by science.

Milk fat synthesis and milk protein synthesis are separate physiologic processes. Interpreting one only in light of the other most likely introduces even more error into the diagnosis of milk fat depression.

It is interesting to note that the interpretation of milk fat: protein ratios did not appear to change after the basis for milk protein reporting was switched from milk fat to true protein in early 2000 in the US. I do not recommend attempting to interpret milk fat: protein ratios when investigating milk fat depression problems.

There are three major causes for cases of confirmed milk fat depression in dairy herds: overfeeding unsaturated fats, monensin feeding, and SARA. Although fundamentally different, all three share the same end pathway – absorption of excessive amounts of certain trans fatty acids from the small intestine.

Excessive intake of unsaturated fats is the most predictable and repeatable of all causes of milk fat depression. Unsaturated fats cause milk fat depression when they are transformed and then incompletely bihydrogenated in the rumen. Some of the intermediate forms of these fatty acids (particularly trans 18:1 fatty acids) are then absorbed at the small intestine and are taken up by the mammary gland (Figures 1 and 2). There they strongly inhibit milk fat synthesis, even at very low doses (5 grams or less per day). The degree of escape of trans fatty acids from the rumen depends largely on the amounts of their unsaturated fat precursors (18:2 and 18:3 fatty acids) that are present in the diet. High rates of passage also contribute to more escape of these fatty acids to the rumen. These fatty acids do not have detrimental health effects themselves, thus it is possible for a herd to have milk fat depression without having cow health problems.

The potential for plant source fats to cause milk fat depression depends on both their content of unsaturated fatty acids and their rate of release in the rumen. Slowly released plant fat sources such as whole cottonseed present much less risk than do rapidly released plant fat sources such as wet distillers grains. Animal source fats or ruminals by-pass fats pose little risk for incomplete bihydrogenation and milk fat depression.

Molensin supplementation may contribute to milk fat depression, but should not cause problems by itself when properly dosed. Supplemental on the high end of the dosage range (15 to 22 grams per ton) only depresses milk fat percentage slightly (about 0.1 to 0.2 percent). The degree of depression may wane as it is fed for a longer time. Molensin feeding appears to interact with excessive feeding of unsaturated fats and ruminal acidosis to cause milk fat depression. Interestingly, molensin helps prevent ruminal acidosis (probably by inhibiting lactate producers and favoring lactate utilizers), yet still has the overall effect of reducing milk fat percentage. If a herd experiences noticeable milk fat depression soon after starting to feed molensin, it is better to investigate and correct other causes rather than to automatically remove it from the diet.

Causes of milk fat depression

Subacute ruminal acidosis is the third major rule-out as a cause for milk fat depression. Ruminal acidosis does not depress milk fat percentage by reducing the proportion of propionate absorbed from the rumen, as was previously thought. Rather, it apparently causes milk fat depression by inhibiting bacteria responsible for fatty acid bihydrogenation in the rumen. Thus, more trans fatty acids are absorbed, even if the intake of unsaturated fatty acids was not necessarily high.

Clinical evidence suggests that the link between ruminal pH and milk fat depression is weak. Many herds with substantially depressed ruminal pH have no milk fat depression at all. This suggests that low ruminal pH probably has to interact with some aspect of dietary fat feeding or time before milk fat depression occurs.

If true milk fat depression problems are verified in a herd, then it is important to evaluate the three key risk factors – feeding excessive unsaturated fats, SARA, and molensin feeding (especially if fed at higher doses or if accidentally over-supplemented). Usually two or even all three grams per test present when milk fat depression is severe and prolonged.

Key diagnostic tests could be a wet chemistry analysis of the TMR being fed, evaluation of ruminal pH from a ruminal puncture, and assay of a TMR sample to determine the amount of molensin actually being fed.