



MIR Milk Fatty Acid Analysis: Basic Definitions

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MIR Milk Fatty Acid Analysis

The Why

- Bring attention to the subject for individuals with limited or no knowledge
- Define unique terms in common use for individuals with only a basic awareness
- Provide an introduction to how feeding fat can affect MIR milk fatty acid results
- Not intended for individuals with advanced training or knowledge on this subject



MIR Milk Fatty Acid Analysis

Drivers of On Farm Milk Analysis

- Useful info to diagnose management decisions
 - Milk components
 - Health
 - Reproduction
- Decisions are rapid
- Decisions are based on individual cows
- Cloud-based internet tools available to manage the data



MIR Milk Fatty Acid Analysis Terms

De Novo

Mixed

Preformed



MIR Milk Fatty Acid Analysis

Terms From Sources of FA to Build Milk Fat

Fatty Acids = Chains of Carbons
Length = 4 Carbons (C₄) → 18 Carbons (C₁₈)



Acetate enters
from the
rumen as C₂



Enters the cycle
of enzymes and
links are added

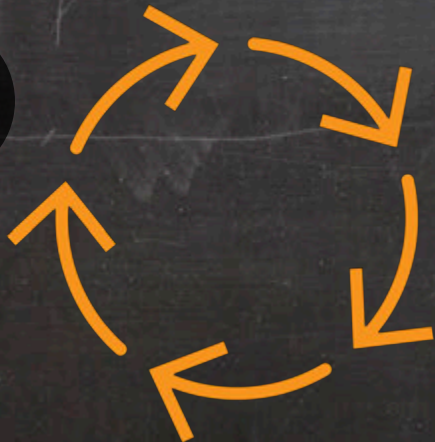


Acetates continue to link
together thru fermentation
of carbohydrates

=

C₁₆

C₂



C₄

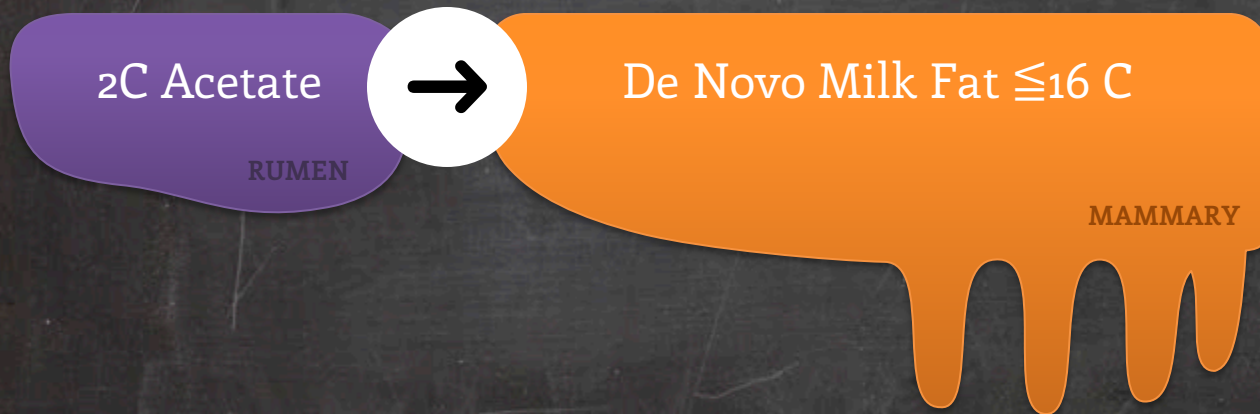
C₆

C₈

C₁₀



MIR Milk Fatty Acid Analysis Making Milk Fat (C₄-C₁₈)



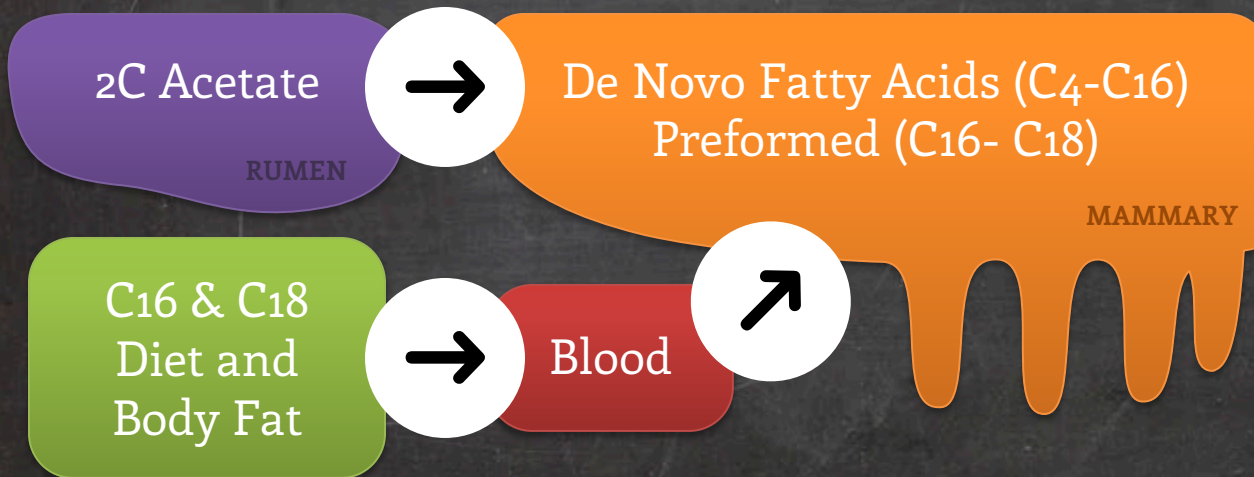


MIR Milk Fatty Acid Analysis

Making Milk Fat (C₄-C₁₈)

Fatty Acids = Chains of Carbons

Length = 4 Carbons (C₄) → 18 Carbons (C₁₈)





MIR Milk Fatty Acid Analysis

Milk Fat Requires All Three Terms

	% of Total FA	g/100g
1 De Novo <C16	24.6	0.97
2 Mixed C16	41.2	1.63
3 Preformed C18	34.4	1.36
Total	100	3.96

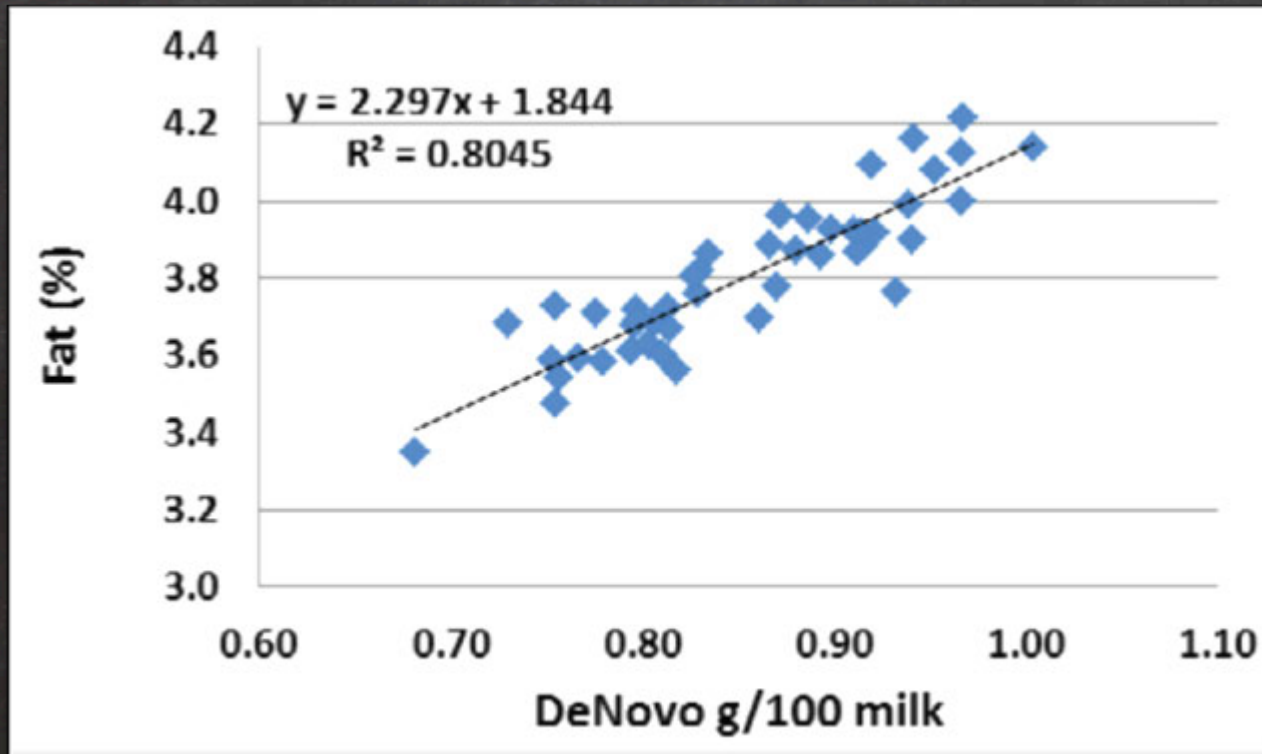
De Novo 1.8 g/100 g
Preformed 2.2 g/100 g

*Data from Woolpert et al. (2017)



MIR Milk Fatty Acid Analysis

Relationship of Milk Fat % and De Novo



In general, a farm needs to have a concentration of de novo fatty acids higher than 0.85 g/100g milk to achieve a bulk tank fat test higher than 3.75%.



MIR Milk Fatty Acid Analysis

Bulk Tank Minimums

Bulk tank “alarms” for Holstein herds that want >3.8% milk fat

Milk Component	Units	Alarm Value
Fat	%	<3.8
De Novo FA	g/100 g milk	<0.8
Mixed FA	g/100 g milk	<1.3
Preformed FA	g/100 g milk	<1.3

Dann. PSU Dairy Nutrition Workshop 2017

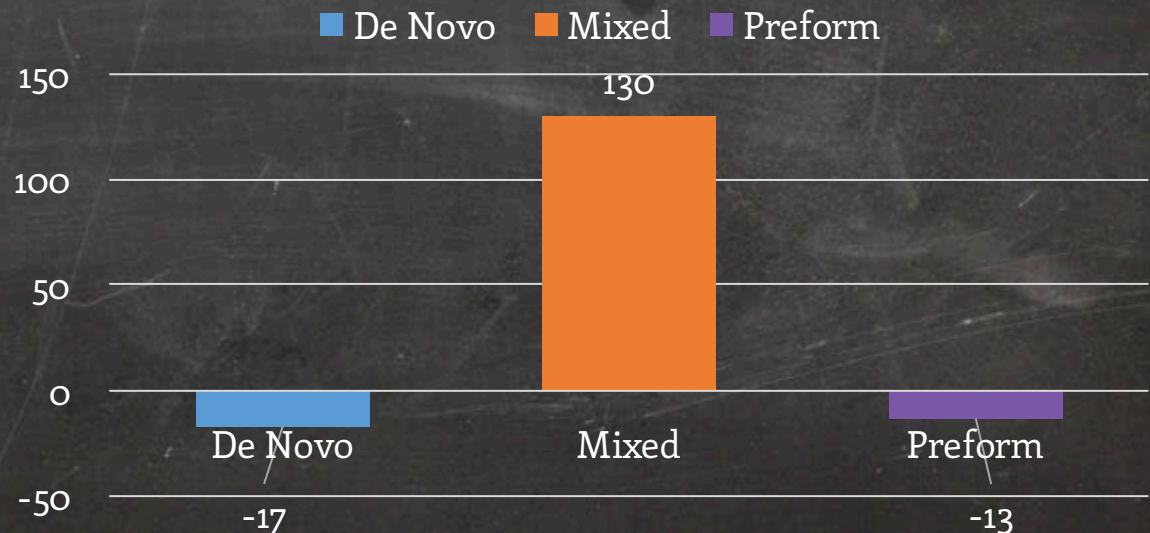
Milk Fatty Acid fractions can be manipulated
by amount and type of fat fed to cows!



MIR Milk Fatty Acid Analysis 2% Palmitic Acid (C16)

	CON	PA
Milk yield, kg/d	32.0	32.2
Fat, %	3.89	4.19
Fat yield, kg/d	1.23	1.32

% Change From CON



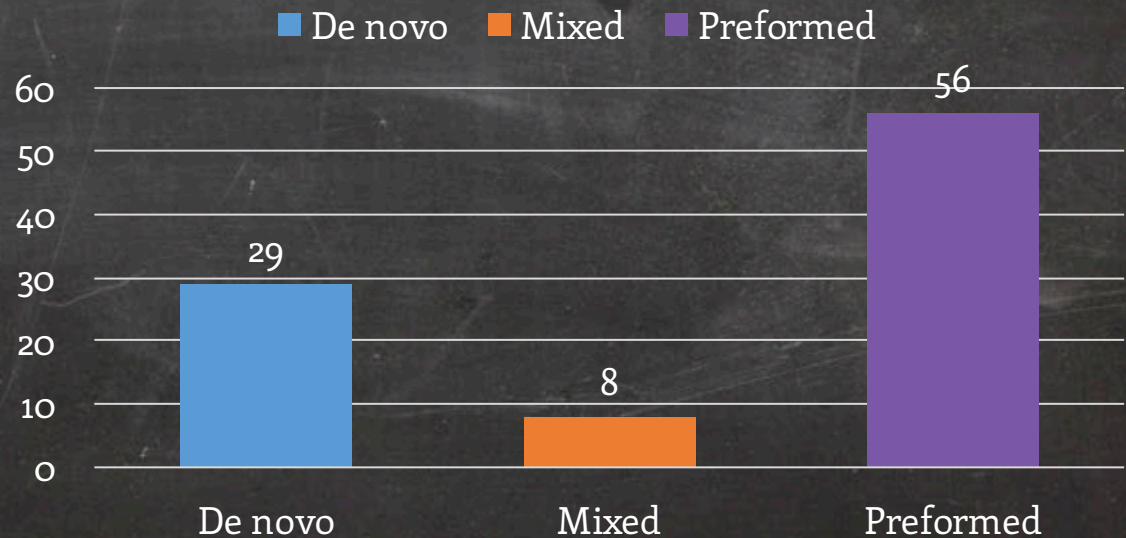
Palmitic Acid
Increases Mixed



MIR Milk Fatty Acid Analysis Cottonseed (C18)

	CON	PA
Milk yield, kg/d	47.5	44.5
Fat, %	3.34	3.87*
Fat yield, kg/d	1.58	1.71*

% Change From CON



Cottonseed
Increases
Preformed

From J. Dairy Sci. (2018) 101:172.

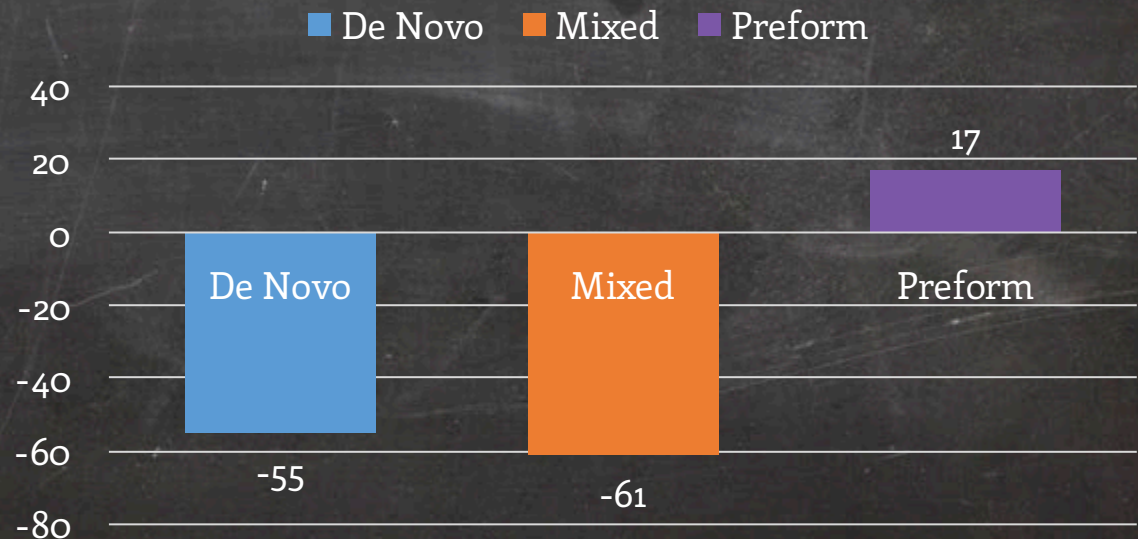


MIR Milk Fatty Acid Analysis

Problem Fats with C18

	CON	5% SBO
Milk yield, kg/d	30.3	28.8
Fat, %	3.53	2.73*
Fat yield, kg/d	1.12	0.85*

% Change From CON



5% Soybean Oil

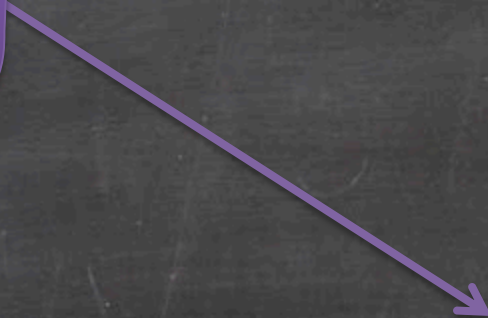


MIR Milk Fatty Acid Analysis

Cause of Milk Fat Decrease

VFA

RUMEN



De novo milk fat ≤ 16 C





MIR Milk Fatty Acid Analysis

Cause of Milk Fat Decrease

VFA
Inhibitors

RUMEN

De novo milk fat ≤ 16 C





MIR Milk Fatty Acid Analysis

Dietary Factors That Create Inhibitors

Dietary factors that cause the rumen to make inhibitors!

Management

Forages/Fiber

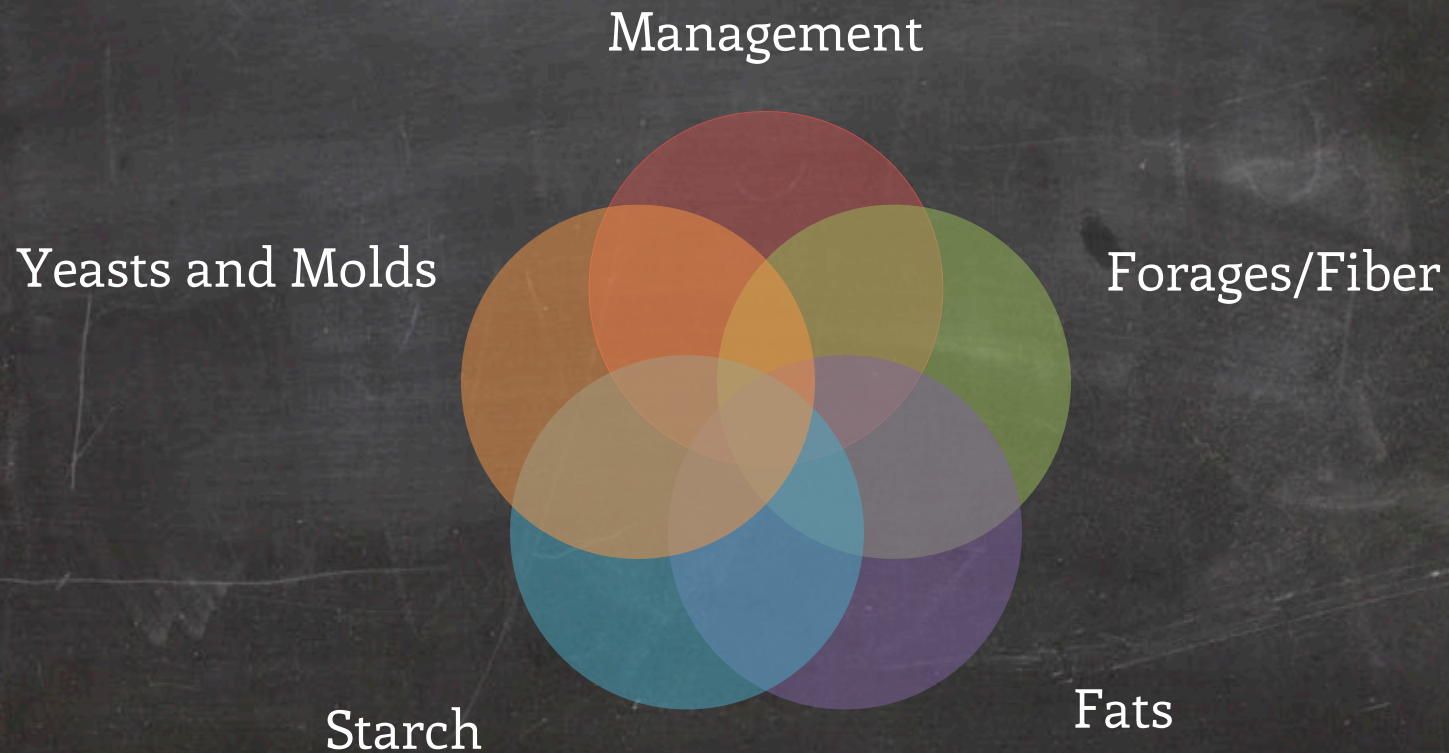
Fats

Starch

Yeasts and
Molds



MIR Milk Fatty Acid Analysis Sorting Through Interactions





MIR Milk Fatty Acid Analysis Main Points

- MIR milk fatty acid analysis is available on-farm to provide information on de novo, mixed, and preformed proportions.
- De novo are made in mammary gland from rumen acetate and comprise half of milk fat.
- Preformed originate from the diet and comprise the other half of milk fat.
- Feeding fat can increase milk fat if no rumen inhibitors are made.



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