



THE ESSENTIAL FATTY ACIDS

Which Fatty Acids are Dietary Requirements and Where Can They Be Found?

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IFAS Extension



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What Fatty Acids are Required in the Diets of Dairy Animals?

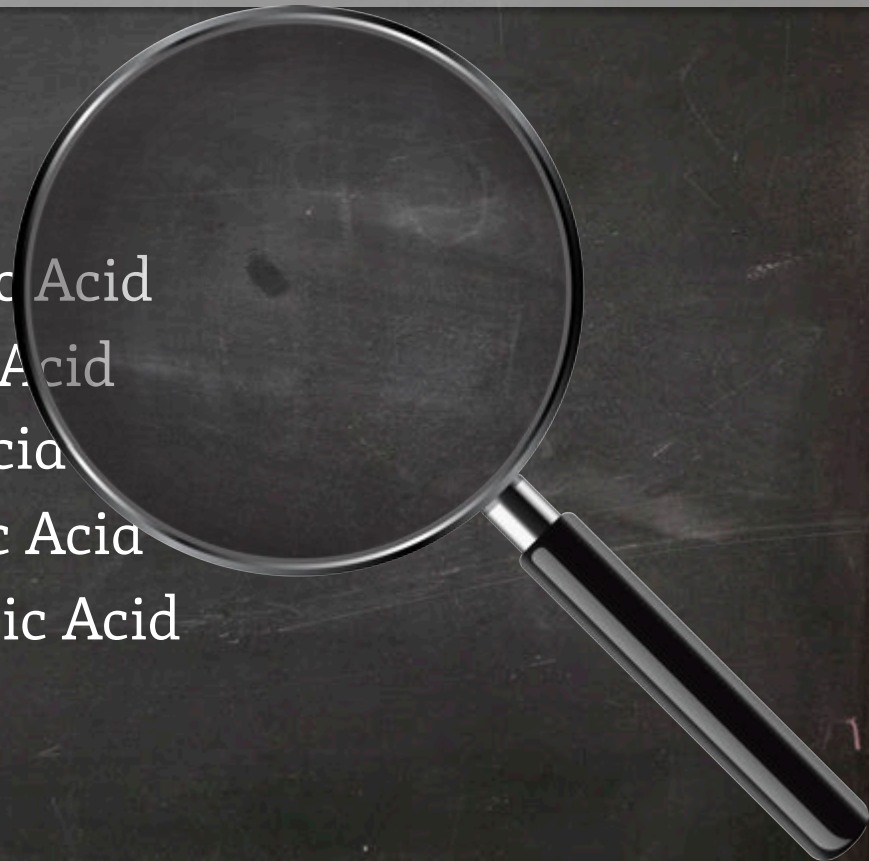
The Devil is in the Details

Crude Protein

- Methionine
- Lysine
- Leucine
- Histidine
- Tryptophan

Crude Fat

- Palmitic Acid
- Stearic Acid
- Oleic Acid
- Linoleic Acid
- Linolenic Acid





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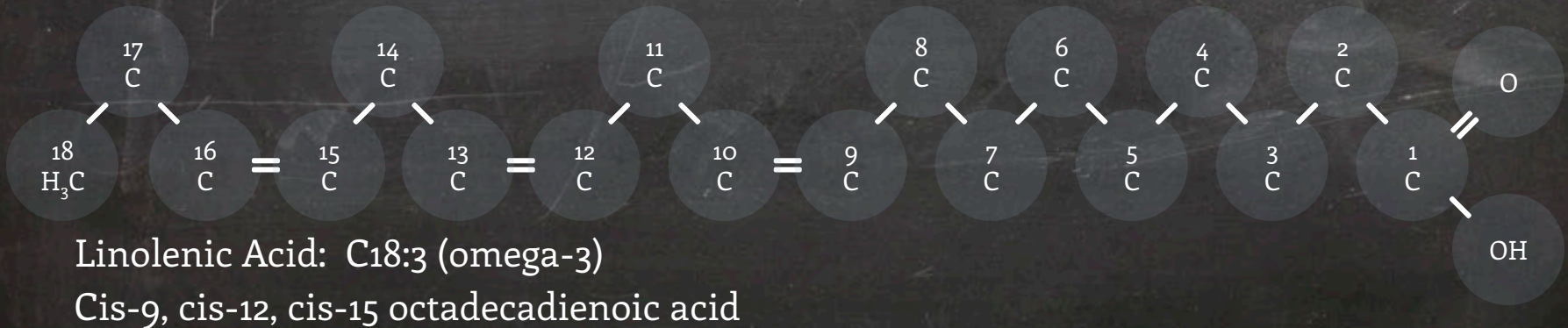
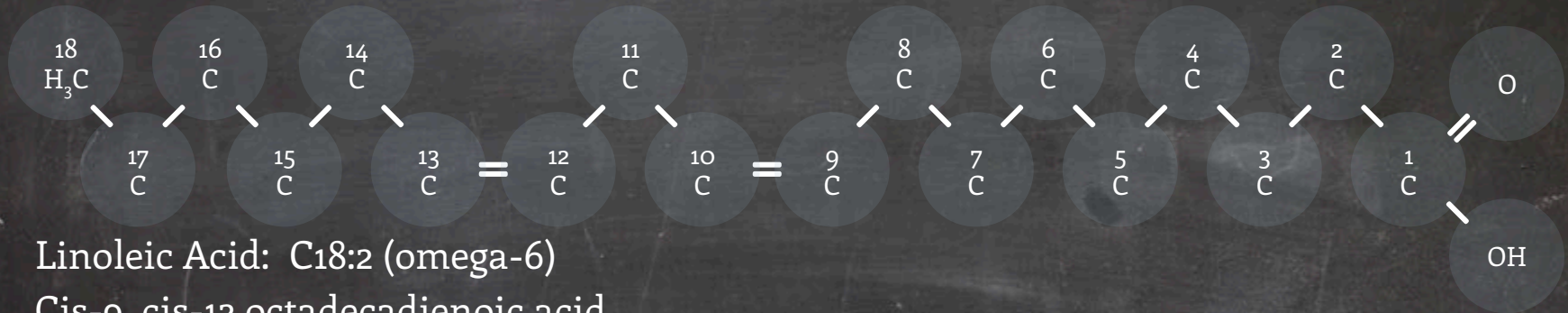
What Fatty Acids are Required in the Diets of Dairy Animals?

- Dietary essential nutrients
 - Must be supplied in the diet because the animal's tissues are incapable of synthesizing the required amounts
- 2 essential long chain fatty acids identified
 - Linoleic acid: C₁₈:₂, omega-6
 - Linolenic acid: C₁₈:₃, omega-3



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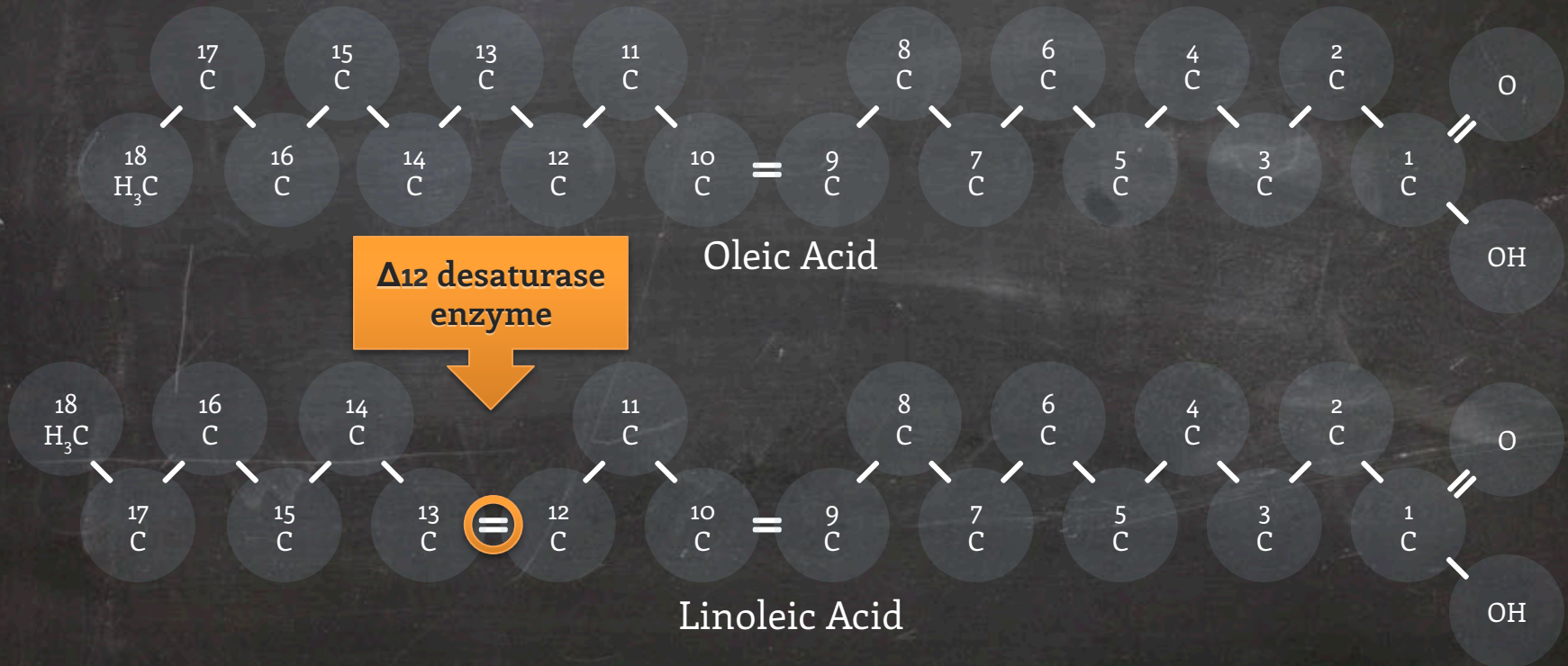
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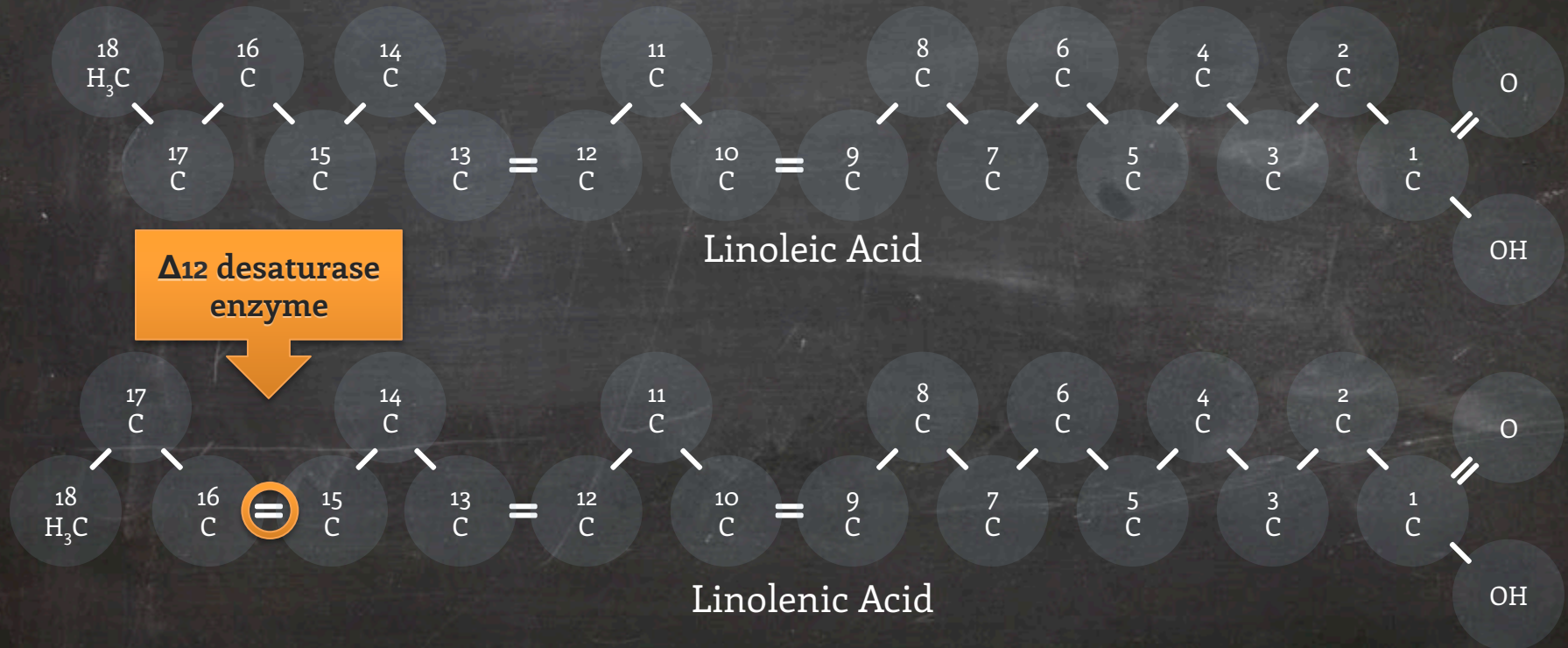
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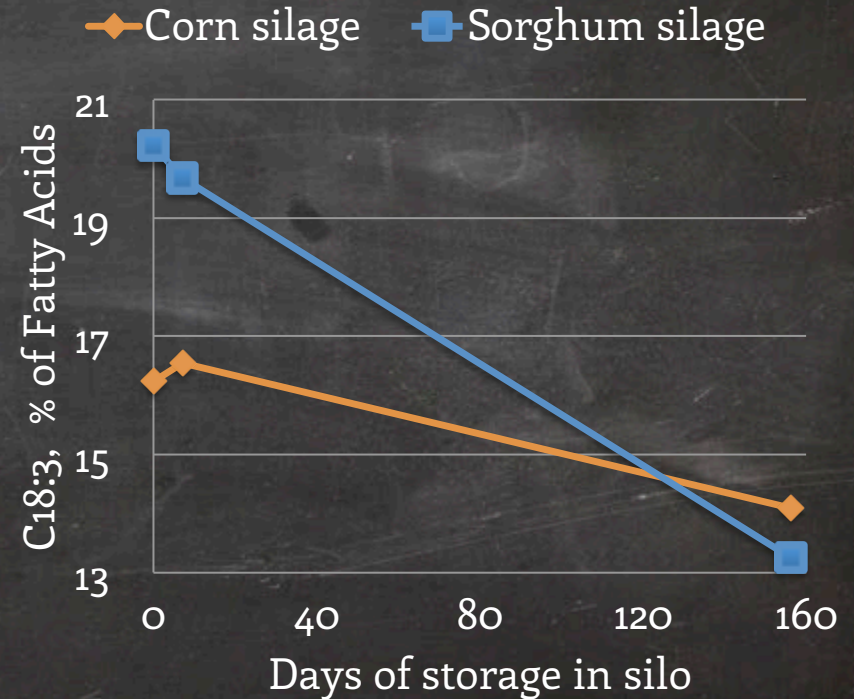
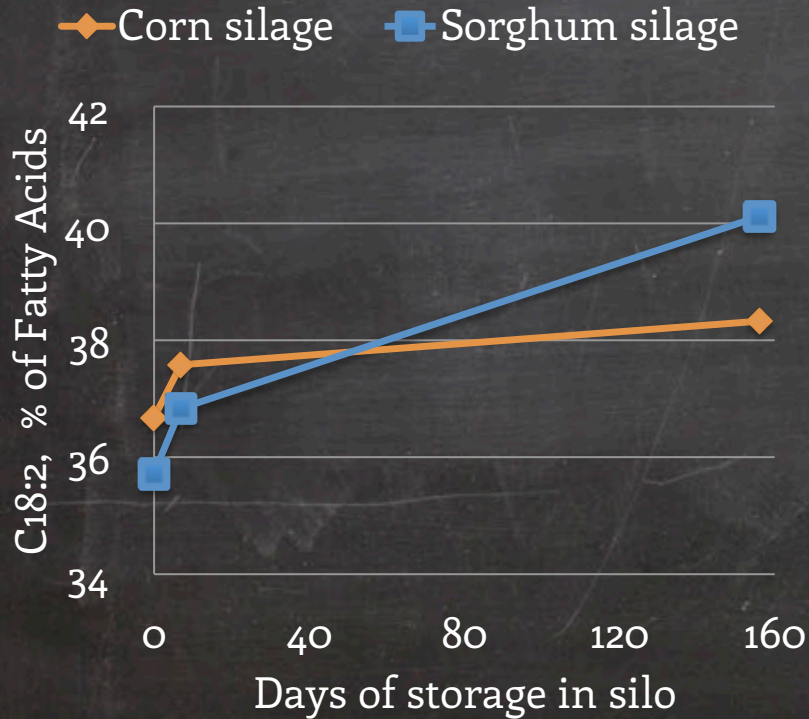
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Typical Fatty Acid Composition of Some Feeds (% of Total Fatty Acids)						
Feed	% Fatty Acids	C16:0 (palmitic)	C18:0 (stearic)	C18:1 (oleic)	C18:2 (linoleic)	C18:3 (linolenic)
Green Forages	1–3	16	2	3	13	61
Corn Silage	2–3	18	2	19	48	8
Cereals	2–3	11	2	9–38	42–68	<1
Soybeans	20	11	4	23	54	8
Cottonseed	20	23	3	18	54	1
Flax Seed	25	5	3	20	16	55
Tallow	90	25	18	41	5	<1
Yellow Grease	90	21	11	44	14	<1



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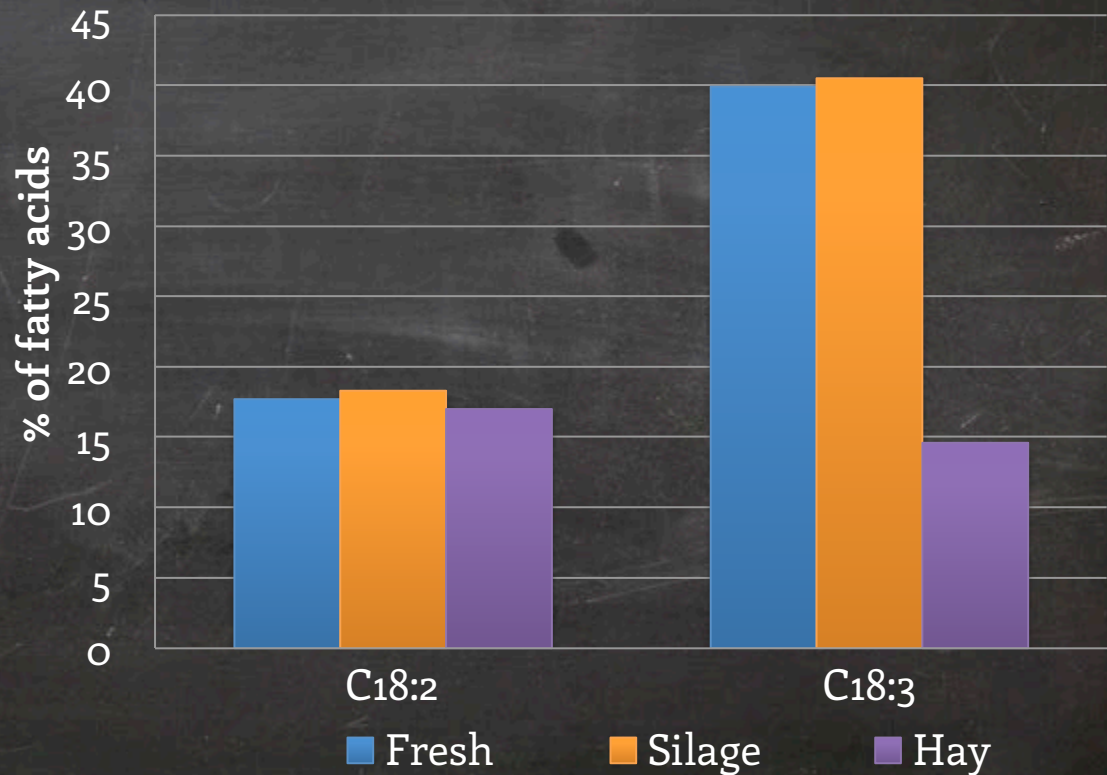
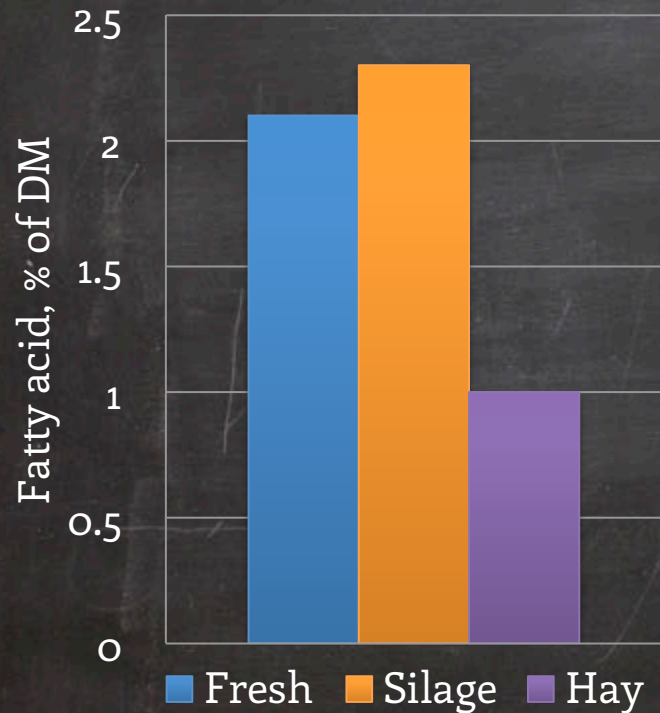
Effect of Ensiling on Essential Fatty Acids





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Effect of Ensiling on Essential Fatty Acids





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Diets Supplying Various Amounts of C18:2 and C18:3

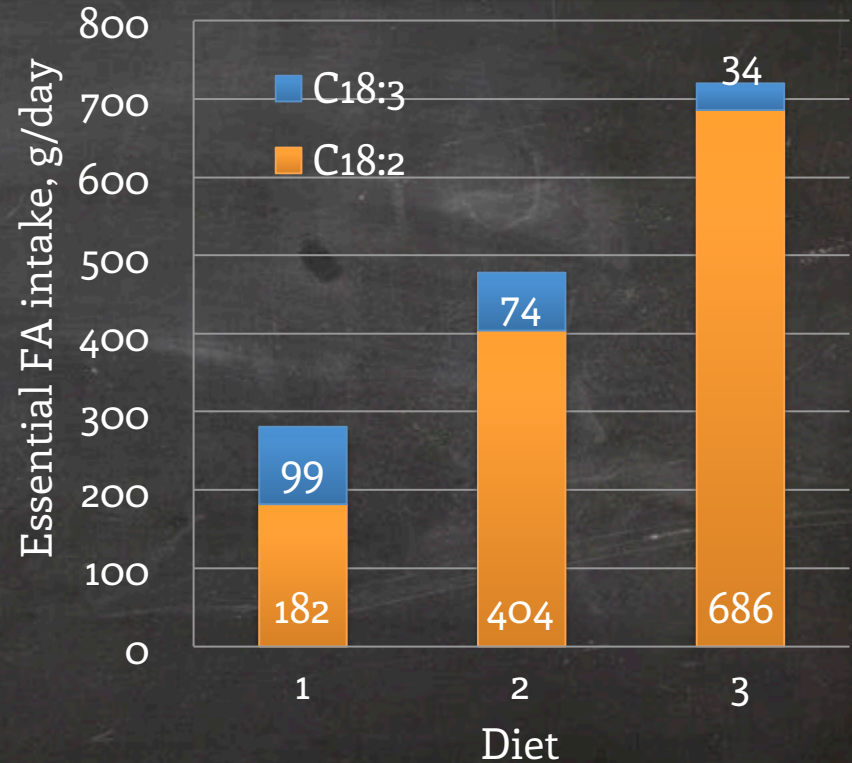
Ingredient	Diet 1	Diet 2	Diet 3
	% of Dietary DM		
Alfalfa Silage	36	16	—
Corn Silage	10	34	45
Corn Ground	—	23.4	19
Barley Rolled	28	—	—
Soybean Meal Solv/Extruded	9	12	11
Soy Hulls / Citrus Pulp	13	8	6
Animal-Vegetable Blend	—	2.6	—
Whole Cottonseed	—	—	15
Mineral / Vitamin Mix	4	4	4

DM intake of 56 lb /day and milk yield of 90 to 95 lb/day, NRC 2001



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Intake of Total and Essential Fatty Acids by
Lactating Cows Fed 3 Different Diets (CPM Fat Submodel)

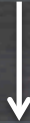




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Other Important Long Chain FA Needed in Tissues are Synthesized from the 2 Essential FA

Linoleic Acid (C18:2)



Arachidonic Acid (20:4)

Linolenic Acid (C18:3)



Eicosapentaenoic Acid (C20:5)



Docosapentaenoic Acid (C22:5)



Docosahexaenoic Acid (C22:6)



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What Fatty Acids are Required in the Diets of Dairy Animals?

- Linoleic and linolenic acids must be in the diet of dairy animals to meet their requirement and serve as parent compounds for other long chain fatty acids
- The fatty acids of cereal grains and oil seeds are enriched in linoleic acid; however, only oil seeds are excellent sources because of their high oil content
- Fresh or ensiled temperate grasses and linseeds are excellent sources of linolenic acid
- Forages lose much of their fatty acid and linolenic acid content when made into hay but not silage
- Intake of essential fatty acids by dairy cows can vary widely