

# Effect of different amounts of extruded flaxseed in diets for dairy cows on chemical and fatty acid composition of milk and cheese

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## AIMS

To improve the omega-3 fatty acid (FA) content of milk and ripened cheese by including extruded flaxseed in dairy cows diets  
 To evaluate the transfer of omega-3 FA from milk to ripened cheese

## CONCLUSIONS

FA profile of milk and ripened cheese can be improved by supplementing dairy cows diets with extruded flaxseed  
 The transfer of omega-3 FA from milk to cheese is very high and seems to be not related to the inclusion level of extruded flaxseed in the diet

## MATERIAL and METHODS

**Animals:** 18 Holstein-Friesian cows (DIM: 108–48 d, parity: 1.6–0.9, initial milk yield: 35.5–9.2 kg/d)  
**Experimental design:** 3X3 Latin Square design  
 3 homogeneous groups (6 cows/group) x 3 experimental periods (14 days/each) x 3 isonitrogenous and isoenergetic diets  
**Diets:** TMR plus 0 (**Control**), 500 (**EF500**) or 1000 (**EF1000**) g/head/d of extruded flaxseed  
**On 7<sup>th</sup> and 13<sup>th</sup> day of each period:**  
 - individual milk samples were collected for the determination of chemical composition and FA profile  
 - two cheese-making trials (11 L cheese vats) were performed using a representative milk sample obtained from each group  
**After 90 days of ripening**  
 Cheeses were analyzed for chemical composition and FA profile  
**Statistical analysis**  
 Data were analyzed using a split plot within a Latin Square whole plot design and analyzed using the Proc GLM (SAS).



Laboratory cheese-making

## RESULTS

Effect of diet on fat content and fatty acid (FA) profile of individual milk

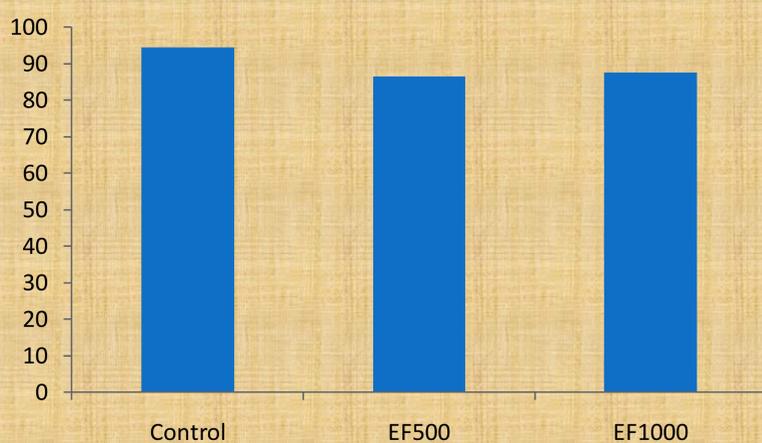
|              |      | Diet        |             |             | SEM          | Control vs. EF500 and EF1000 | EF500 vs. EF1000 |
|--------------|------|-------------|-------------|-------------|--------------|------------------------------|------------------|
|              |      | Control     | EF500       | EF1000      |              |                              |                  |
| <b>Fat</b>   | % DM | 3.52        | 3.48        | 3.52        | 0.092        | ns                           | ns               |
| <b>SFA</b>   | % FA | 72.5        | 72.9        | 71.7        | 0.395        | ns                           | ns               |
| <b>MUFA</b>  | % FA | 22.7        | 22.1        | 22.8        | 0.325        | ns                           | ns               |
| <b>PUFA</b>  | % FA | 3.59        | 3.93        | 4.29        | 0.087        | ns                           | ns               |
| <b>Ω6</b>    | % FA | 2.74        | 2.80        | 2.98        | 0.059        | ns                           | ns               |
| <b>Ω3</b>    | % FA | <b>0.30</b> | <b>0.52</b> | <b>0.61</b> | <b>0.095</b> | <b>&lt;0.05</b>              | ns               |
| <b>Ω6/Ω3</b> | % FA | <b>9.68</b> | <b>5.54</b> | <b>5.16</b> | <b>0.240</b> | <b>&lt;0.05</b>              | ns               |

Effect of diet on fat content and fatty acid (FA) profile of cheese

|              |      | Diet        |             |             | SEM          | Control vs. EF500 and EF1000 | EF500 vs. EF1000 |
|--------------|------|-------------|-------------|-------------|--------------|------------------------------|------------------|
|              |      | Control     | EF500       | EF1000      |              |                              |                  |
| <b>Fat</b>   | % DM | 40.3        | 40.0        | 40.9        | 0.048        | ns                           | ns               |
| <b>SFA</b>   | % FA | 71.4        | 70.4        | 69.6        | 0.332        | ns                           | ns               |
| <b>MUFA</b>  | % FA | 25.0        | 25.5        | 26.1        | 0.314        | ns                           | ns               |
| <b>PUFA</b>  | % FA | <b>3.65</b> | <b>4.07</b> | <b>4.35</b> | <b>0.126</b> | <b>&lt;0.05</b>              | ns               |
| <b>Ω6</b>    | % FA | 2.79        | 2.88        | 2.98        | 0.316        | ns                           | ns               |
| <b>Ω3</b>    | % FA | <b>0.31</b> | <b>0.53</b> | <b>0.63</b> | <b>0.043</b> | <b>&lt;0.01</b>              | ns               |
| <b>Ω6/Ω3</b> | % FA | <b>9.38</b> | <b>5.53</b> | <b>4.94</b> | <b>0.592</b> | <b>&lt;0.01</b>              | ns               |

Control = diet without extruded flaxseed; EF500 = diet with 500 g/head/d of extruded flaxseed; EF1000 = diet with 1000 g/head/d of extruded flaxseed; SFA = saturated fatty acids; MUFA = mono-unsaturated fatty acids; PUFA = poly-unsaturated fatty acids; ns = not significant

Effect of diet on transfer (%) of omega-3 fatty acids from milk to cheese



Control = diet without extruded flaxseed; EF500 = diet with 500 g/head/d of extruded flaxseed; EF1000 = diet with 1000 g/head/d of extruded flaxseed;

## DISCUSSION

As expected, increasing amounts of extruded flaxseed in the diet improved, even if not linearly, the omega-3 FA concentration of milk. A similar pattern was observed for 90-d ripened cheese.

The transfer of omega-3 FA from milk to ripened cheese was on average 89.6% and not significantly different among the 3 experimental diets



Cheese ripening

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