Effects of a by-pass Omega-3 source on milk yield, milk composition and fertility

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NOREL ANIMAL NUTRITION

PROGANDO Suministros Agrarios

Agenda

1. Background

2. Product development

3. Field trial

4. Discussion, Conclusions and Further research

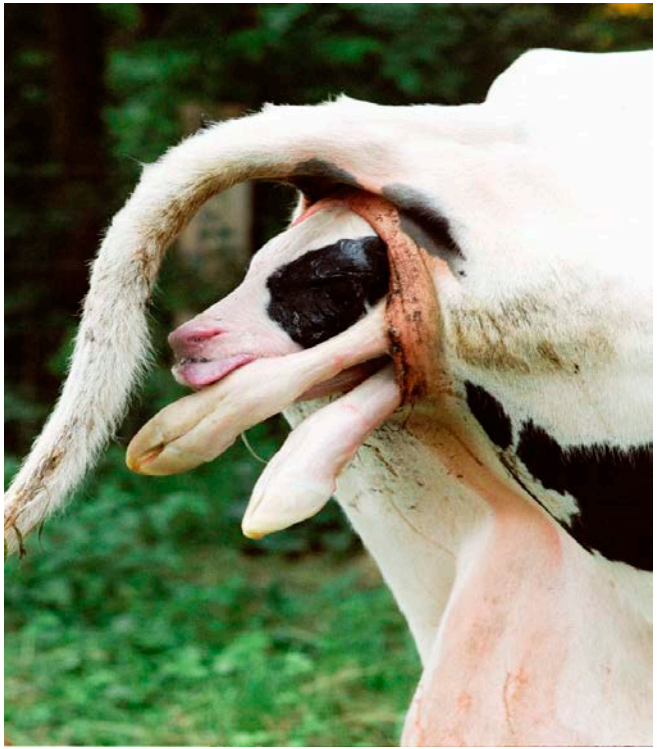
Background. Consumer's behaviour

- Increasing consumers' demand towards healthier food

- Omega-3 & cardiovascular diseases, neurological health, immunity, cancers (Abuajah *et al*., 2014)

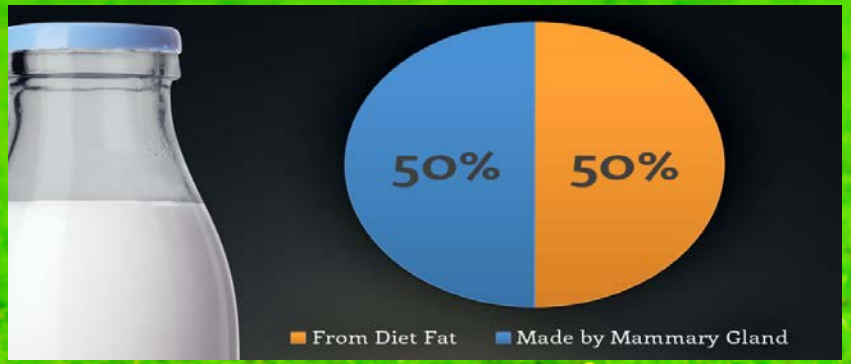
Background. Farmer's side

• Better reproductive performance: the use of flaxseed improves cows fertility in 50.3% with respect to sunflower seed (Ambrose *et al*., 2006)



Background. Farmers and market

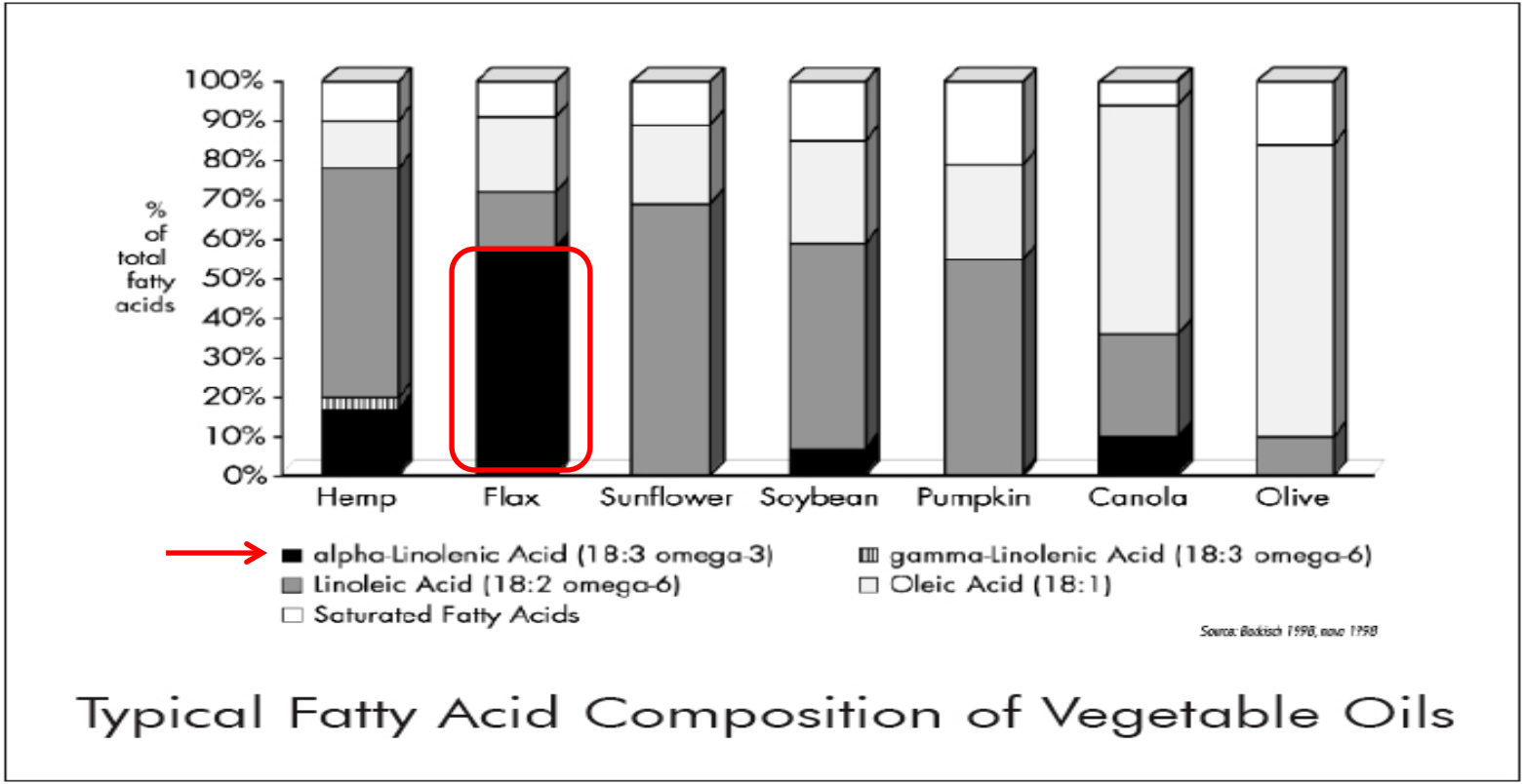
- Omega-3milk products: premium price



How to do it:

animal nutrition

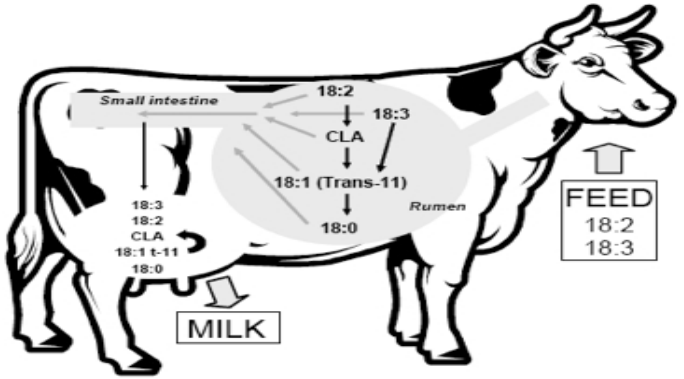
Sources of Omega-3



Typical Fatty Acid Composition of Vegetable Oils

…It seems easy, let’s include linseed

PROBLEMS!



- Ruminal toxicity – feed efficiency

- MILK FAT DEPRESSION (MFD) and protein

Fast, Low Quantities of trans-10 required, recovery time

Necessity to develop products that allow protecting Omega-3 against rumen biohydrogenation

Hi-FLAX®

In vitro trial

ASSESSMENT OF PROTECTION AGAINST RUMINAL BIOHYDROGENATION OF DIFFERENT FORMS OF FLAXSEED

Fatty acid	T2: Flax oil	T3: Calcium soap of flax fatty acids	T4: Absorbed flax oil	T5: Extruded linseed	T6: Hi-FLAX
% CF	100	78.4	65.4	25.1	95.2
C18:3 content on the sample (%)	51.66	28.24	52.27	48.51	13.88
C18:3 by-pass (*in vitro*) (% of the previous –of the initial content)	**19.9**	**18.7**	**15.2**	**17.9**	**30.5**
FINAL BY-PASS C18:3 (grams of C18:3 per 100 grams of product)	10.28	4.14	5.20	2.17	**4.02**

+ 85.25%

Although the final content is OK, they are not well-protected:

-toxic for rumen microbiota and
- decrease in milk fat %

95%*13.88%*30.55% = 4.02

25%*48.5%*17.90% = 2.17

Filed Trial

Substitution of extruded linseed to Hi-FLAX®

Methodology

- **Farms and cows selected**
  - One dairy cow farm, Galicia (NW Spain)
  - 102 milking Holstein cows
  - Average milk yield per cow = 33 liters/cow/day in the previous months

- **Production systems and milking management**
  - Cows were housed in cubicles and dry lots
  - 2-3 milking times

- **Diets (isoenergetic and isocost)**

Feed materials	**Control diet** Concentrate (kg)	**Exp. Diet (Hi-Flax®)** Concentrate(kg)
Rapeseed meal	310	360
Corn silage	230	252.2
Soy 44	220	224
Extruded Linseed/Hi-Flax	**100**	**50**
Barley	50	45
Soy oil	30	8.5
CaCO3	30	
Urea	13	
Mineral premix	7	
NaCl	8.5	
E. oil	1	
Mold inhibitor	0.5	

Nutritional analysis	Control diet (DM)	Exp. Diet (Hi-Flax®) (DM)
ENl (kcal/kg)	1,782.69	
CP (%)	28.23	28.24
RDP (%)	15.71	15.28
RUP (%)	12.52	12.96
ADF (%)	8.67	8.61
NDF (%)	14.96	14.02
NFC (%)	32.10	32.90
Starch (%)	18.78	18.89
CF (%)	7.75	7.91
Ca (%)	1.46	
P (%)	0.66	0.65
Mg (%)	0.32	0.31
C18:3 (%)	**1.86**	**0.80**

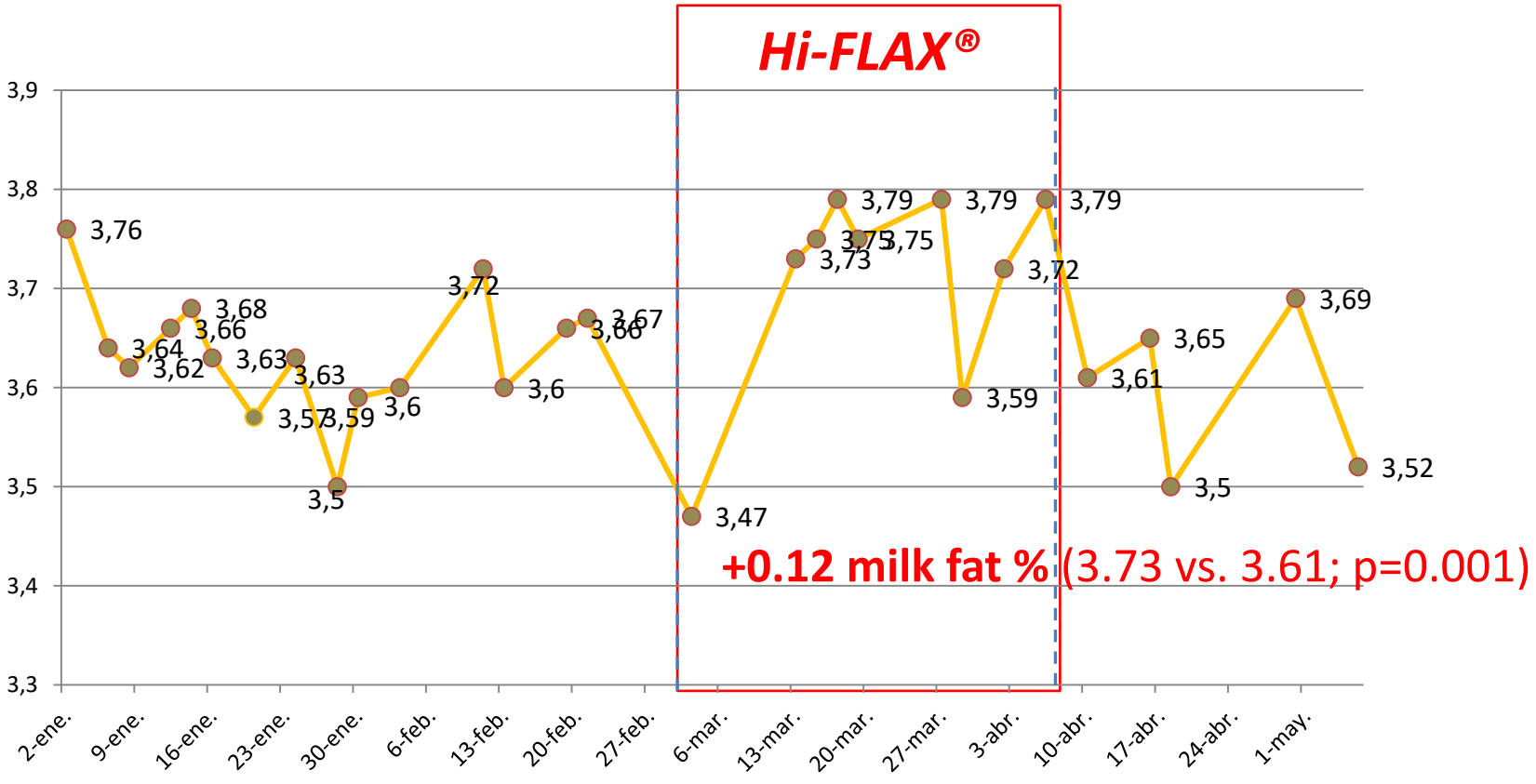
Methodology

- **Duration of the trial and dates**

	Dates (2015)
Period 1 (Control period 1)	12nd Jan – 2nd March
Period 2 (Experimental period)	3th March-7th April
Period 3 (Control period 2)	8th April-6th May

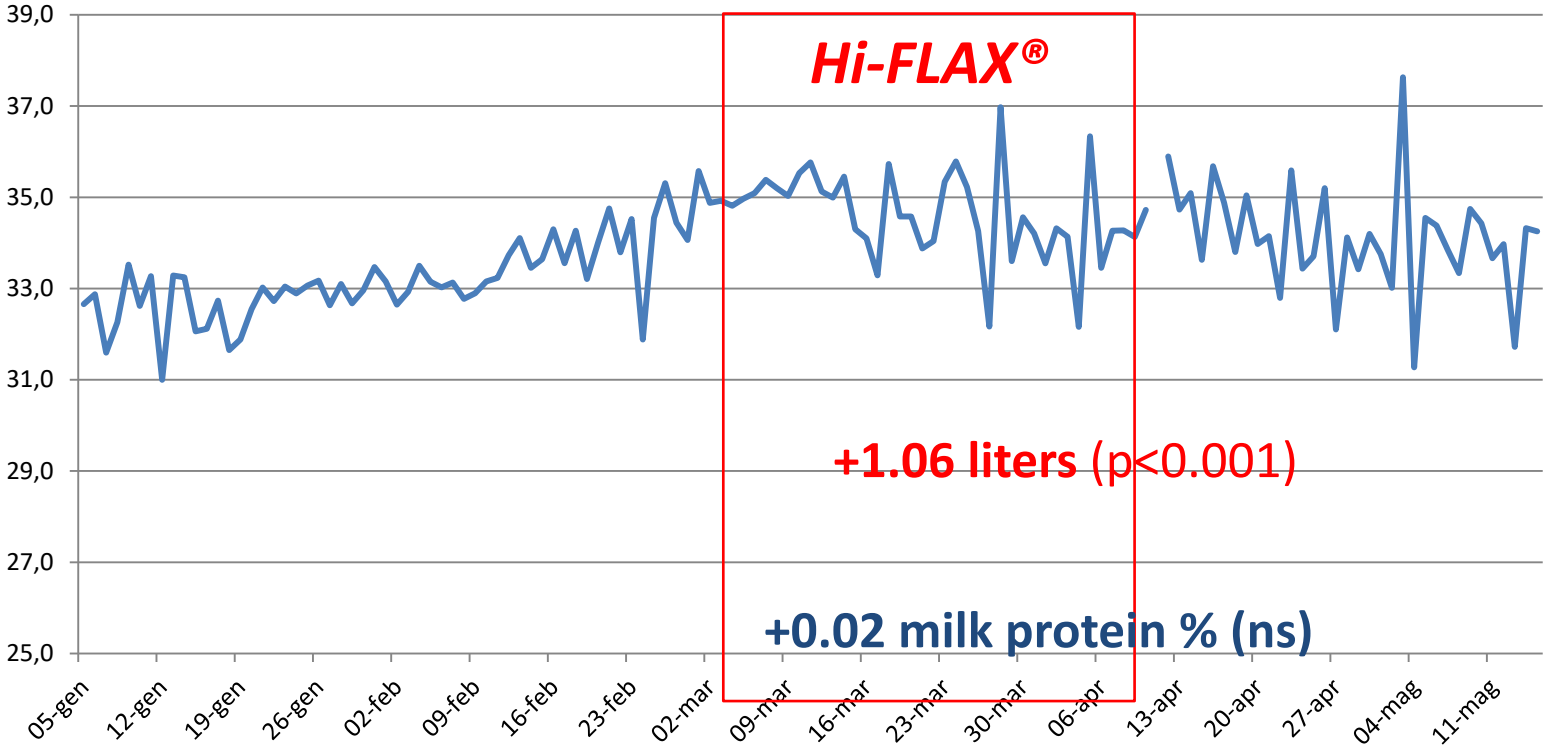
- **Sampling and analysis**
  - Data for milk fat, milk protein, milk yield, urea, and Gr/Pr were taken daily. Fatty acid profiles were taken weekly

Results



+0.12 milk fat % (3.73 vs. 3.61; p=0.001)

Results

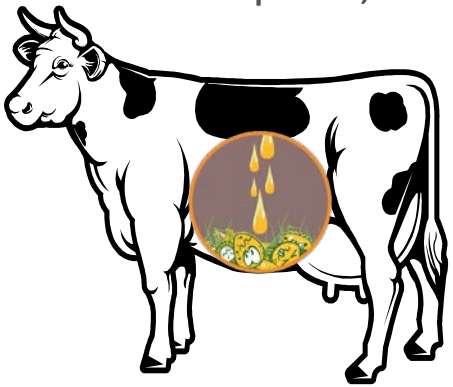

39,0
37,0
35,0
33,0
31,0
29,0
27,0
25,0
Hi-FLAX®
+1.06 liters (p<0.001)
+0.02 milk protein % (ns)
05-gen
12-gen
19-gen
26-gen
02-feb
09-feb
16-feb
23-feb
02-mar
09-mar
16-mar
23-mar
30-mar
06-apr
13-apr
20-apr
27-apr
04-mag
11-mag

Results: Rates of transference to milk

	Transfer from **C18:3n3** source to **milk**
Control diet	8.18%
Experimental diet (Hi-FLAX®)	13.48% (**164.42%**)

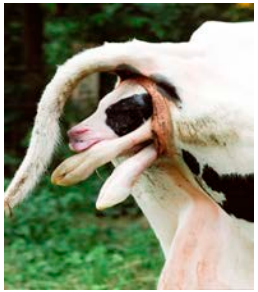
Discussion, Conclusions & Further research

- H-FLAX® is a useful tool for the dairy sector in order to:
  - Reduce the negative interactions between feeding PUFAs and ensuring a healthy rumen environment
  - Achieving the levels of milk fat required by the industry
  - Increasing Omega-3 transfer rate: which is useful for milk sales price, immunity and reproduction



Discussion, Conclusions & Further research

- Reproduction:
  - Theoretical improvement based on literature: Use of feed materials with a high content in Omega-3, such as flaxseed, improve cows fertility in 50.3% with respect to sunflower seed (Ambrose et al., 2006). Due to the great protection of HI-FLAX's fatty acids, reproductive performance may be even higher
  - Future research assessing on farm effects is need (2017)



THANK YOU VERY MUCH FOR YOUR ATTENTION

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