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Effect of dietary digestible fiber and fat level on the fatty acid content and composition of caecotrophs in rabbits

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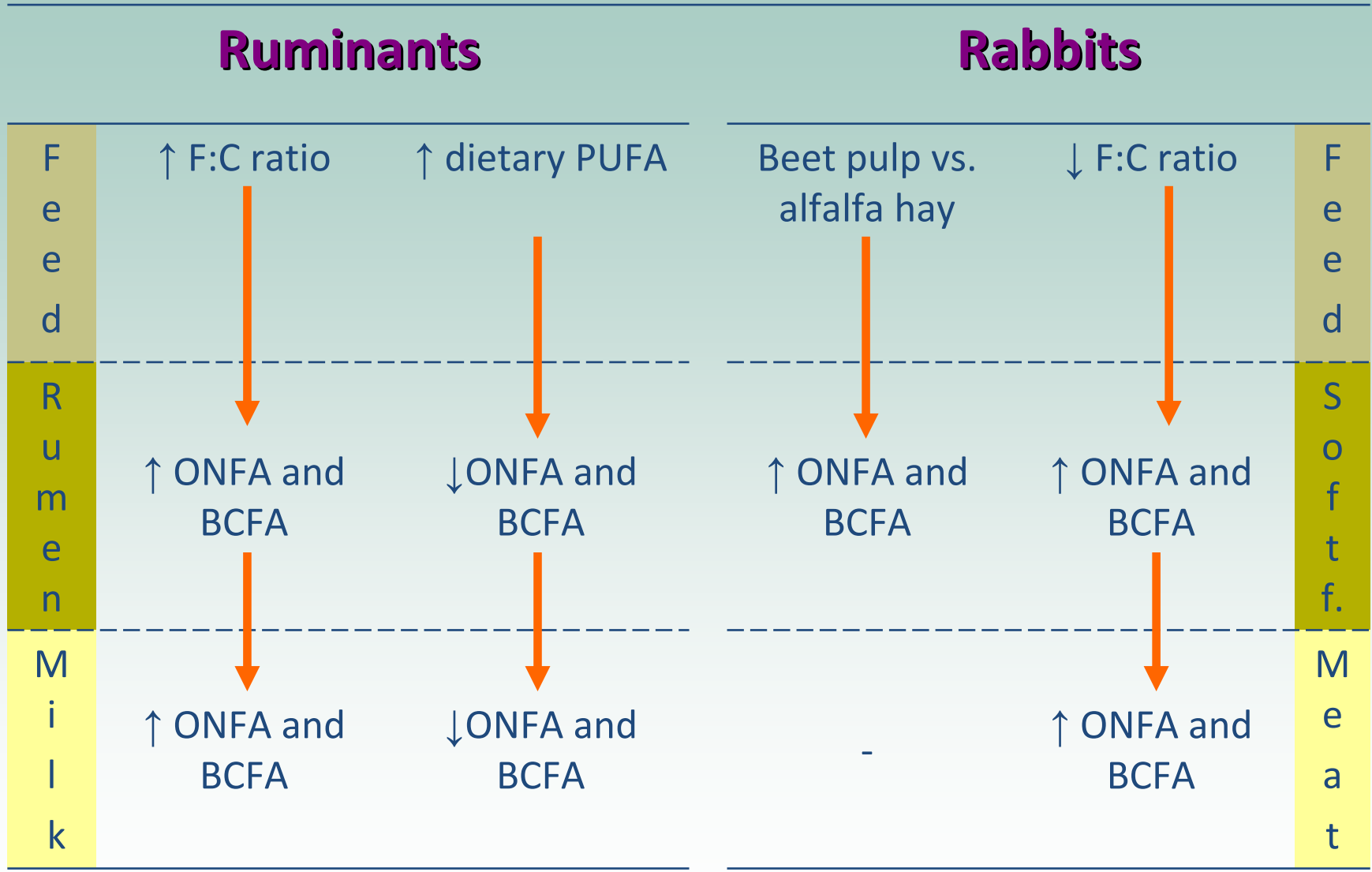
1. Introduction

Products of animals with symbiotic fermentations: distinct amounts of odd-numbered (ONFA), branched-chain (BCFA)

- bacteria = major source of ONFA, BCFA

- Scientific interest → properties (anticarcinogenic, low melting point, diagnostic tools of rumen function)

Research objectives: relationship between dietary treatments, microbial activity patterns and ONFA, BCFA


Ruminants
Rabbits
Feed
Rumen
Milk
↑ F:C ratio
↑ dietary PUFA
Beet pulp vs. alfalfa hay
↓ F:C ratio
Soft f.
Meat
↑ ONFA and BCFA
↓ONFA and BCFA
↑ ONFA and BCFA
↑ ONFA and BCFA
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↓ONFA and BCFA
-
↑ ONFA and BCFA

2. Objective

Effects of dietary:

- Digestible fiber (**DgF**: hemicellulose and pectins) and

- Unsaturated fat (**SO**: soybean oil) addition

maintaining a similar **ADF** level

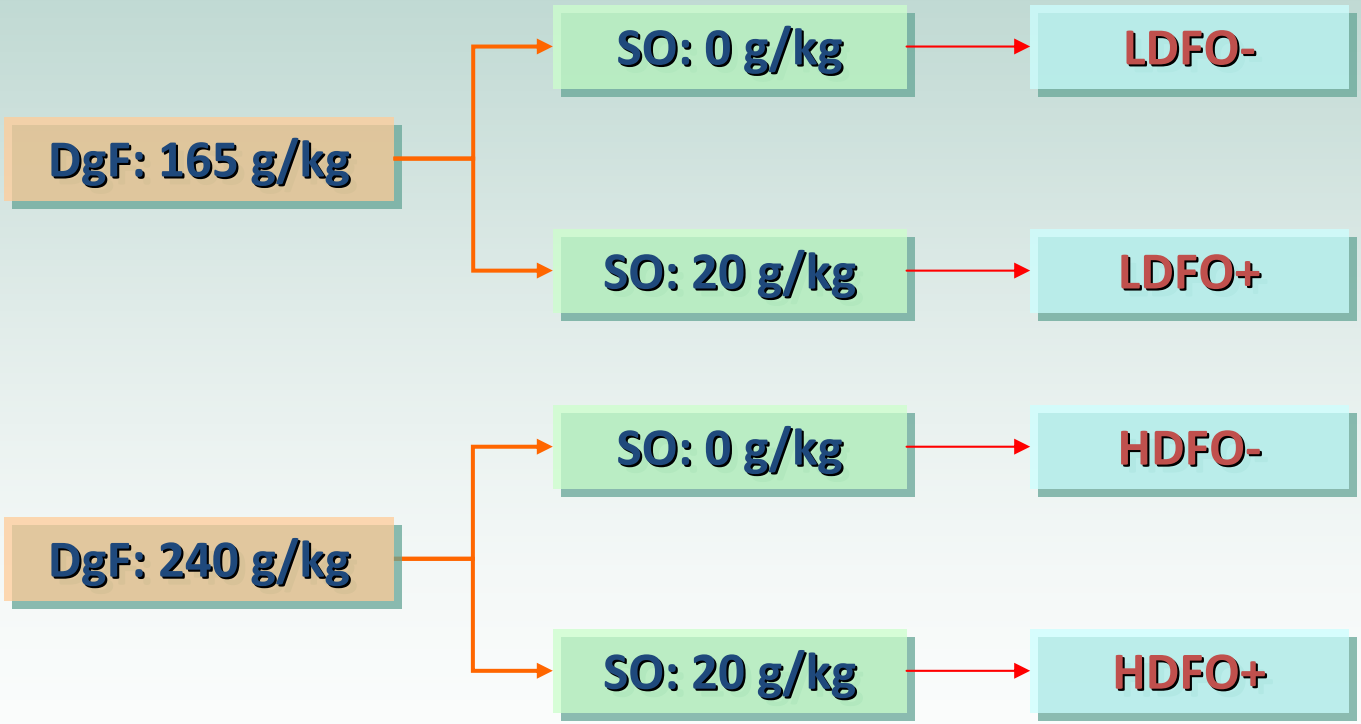
on

the ONFA, BCFA, OHFA* of caecotrophs and the daily recycling via caecotrophy

**** Hydroxy FA= components of bacterial LPS***

3. Materials & Methods

- 48 weaned rabbits (age 35 days)
- 4 treatments (2×2 design) with 2 levels of DgF and SO



Ingredients (g/kg) of the experimental diets

	Treatment			
	LDFO-	LDFO+	HDFO-	HDFO+
Dehydrated alfalfa	284.0	284.0	160.0	160.0
Wheat straw	60.0	60.0	60.0	60.0
Sugar beet pulp	30.0	30.0	175.0	185.0
Wheat bran	30.0	30.0	180.0	180.0
Barley grain	434.0	404.0	250.0	220.0
Soybean meal 44%	70.0	70.0	70.0	70.0
Sunflower meal	80.0	90.0	90.0	90.0
Soybean oil	-	20.0	-	20.0
L-Lysine	0.8	0.8	1.5	1.5
DL-Methionine	1.2	1.2	1.6	1.6
L-Threonine	1.0	1.0	1.5	1.5
Limestone	1.0	1.0	3.4	3.4
NaCl	3.0	3.0	2.0	2.0
Mineral-Vitamin Premix	5.0	5.0	5.0	5.0

Chemical composition (g/kg) and digestible energy (MJ DE/kg) of the experimental diets

		Treatment			
		LDFO-	LDFO+	HDFO-	HDFO+
Digestible energy		10.0	10.4	10.0	10.5
Crude protein		159.8	159.6	160.0	159.0
Ether extract		19.1	38.3	19.0	38.0
NDF		303.0	302.0	347.0	346.0
ADF		183.0	184.0	184.0	185.0
Digestible fiber (DgF)		165.0	163.0	239.0	240.0
DgF/ADF		0.9	0.9	1.3	1.3
Fatty acids (mg/kg)	*C14:0*	*113*	*122*	*92*	*113*
	C16:0	*3899*	*6035*	*4036*	*6474*
	C16:1	*36*	*54*	*40*	*57*
	C18:0	*523*	*709*	*465*	*780*
	C18:1	*2867*	*7677*	*3247*	*8183*
	C18:2	*10044*	*17523*	*10879*	*18601*
	C18:3	*1410*	*2357*	*1325*	*2388*

Measurements

- **68 days:** light plastic collar application for 24h to collect the caecotrophs
- Freeze drying of caecotrophs

  - Chemical analyses

  - Gas chromatography (GC) for fatty acid methyl esters determination on a HP-88 polar (88%-Cyanopropyl-methylaryl-polysiloxane) capillary column

4. Results

Least square means of caecotrophs fatty acids (mg/100 g DM)

	DgF		SO		SEM	Prob.[1]		
	165	240	0	20		DgF	SO	DgF×SO
Total wt of FA	1419	1548	1328	1641	46.1	**	***	NS
9c,11t-CLA	2.6	4.4	3.0	4.0	0.29	***	**	NS
BCFA[2]	128.2	134.6	127.3	135.5	7.10	NS	NS	NS
OHFA[3]	39.9	45.5	41.1	44.3	2.51	*	NS	NS
ONFA[4]	93.3	108.0	97.5	103.9	4.36	**	NS	NS
ONFA/BCFA	0.74	0.81	0.78	0.77	0.030	*	NS	NS

*[1] NS: non-significant, *: P<0.05, **: P<0.01, ***: P<0.001*

[2] BCFA: Methyl-branched chain fatty acids (iC14:0 + aC15:0 + iC15:0 + iC16:0 + aC17:0 + iC17:0)

[3] OHFA: Hydroxy fatty acids (2OH-C10:0 + 3OH-C12:0 + 3OH-C14:0 + 2OH-C16:0)

[4] ONFA: Odd-numbered fatty acids (C15:0 + C17:0 + C17:1 + C17:2 + C19:0)

Least square means of caecotrophs fatty acids (% of total FA)

	DgF		SO		SEM	Prob.[1]		
	165	240	0	20		DgF	SO	DgF×SO
9c,11t-CLA	0.18	0.28	0.22	0.24	0.017	***	NS	NS
BCFA[2]	9.1	8.7	9.6	6.3	0.28	NS	***	NS
OHFA[3]	2.8	3.0	3.0	2.7	0.14	NS	*	NS
ONFA[4]	6.7	7.0	7.4	6.3	0.20	NS	***	NS
ONFA/BCFA	0.74	0.81	0.78	0.78	0.030	*	NS	NS

*[1] NS: non-significant, *: P<0.05, ***: P<0.001*

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Fatty acid recycling via caecotrophy (mg/day)

	DgF		SO		SEM	Prob.[1]		
	165	240	0	20		DgF	SO	DgF×SO
Total wt of FA	418.3	462.1	394.0	486.4	21.13	*	**	NS
9c,11t-CLA	0.8	1.3	0.9	1.3	0.11	***	NS	NS
BCFA[2]	37.2	40.0	37.3	39.9	2.65	NS	NS	NS
OHFA[3]	11.7	13.7	12.1	13.2	1.10	NS	NS	NS
ONFA[4]	27.3	32.1	28.8	30.6	1.99	*	NS	NS

*[1] NS: non-significant, *: P<0.05, **: P<0.01, ***: P<0.001*

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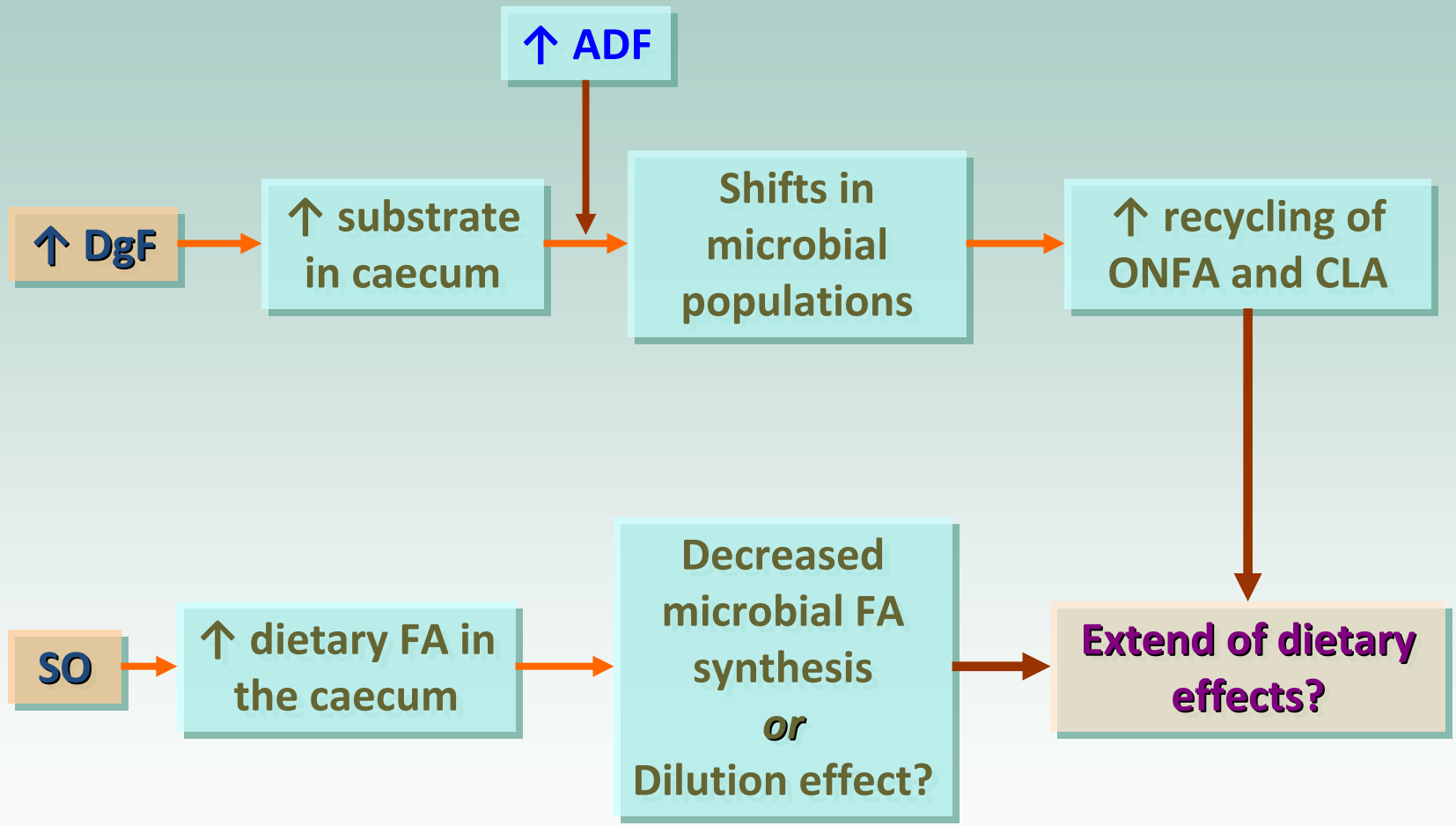
[4] ONFA: Odd-numbered fatty acids (C15:0 + C17:0 + C17:1 + C17:2 + C19:0)

5. Conclusions



Thank you for your attention

Questions