Performances, milk quality, and piglet growth in lactating sows fed former food products

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Session 20
Early career competition 'Innovative approaches to pig and poultry production'

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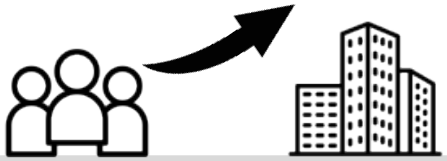
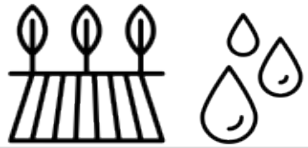
Introduction – Competition : Food vs Feed



Population increases to 9.1 billion by 2050
Increased demand of food

Limited



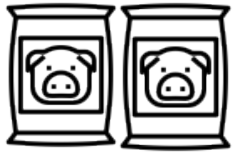
40% of global arable land and
1/3 of cereals produced are for farm animals

Mottet et al. (2017)

Food

vs

Feed



Feeding grains to livestock may be unsustainable

Annually, in EU

153.5 million tonnes of food lost and wasted (Feedback EU, 2022)

Introduction – Feed Alternatives: FFPs

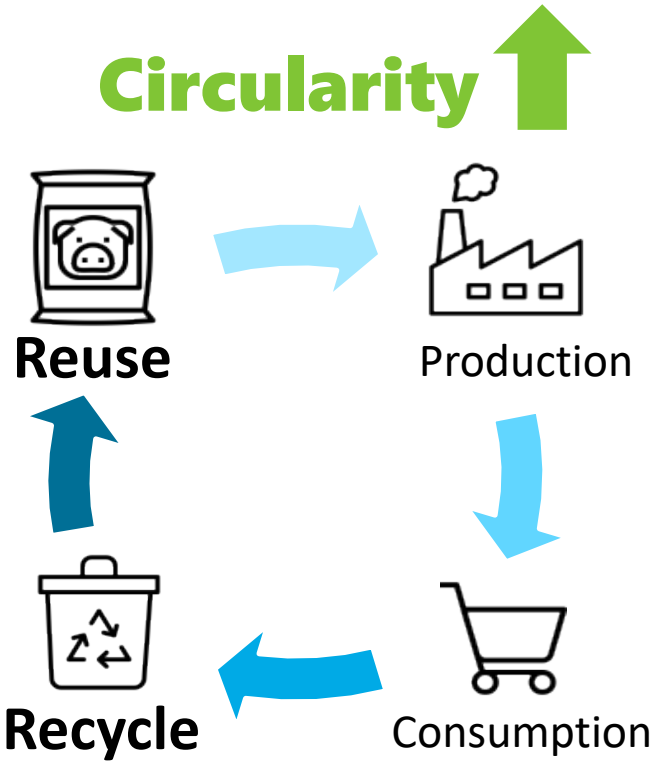
Former food products (FFPs)

- Manufactured for human comsumption
- Fulfill EU food law *(Regulation (EU) No 2017/1017)*
- Undergo production errors or logistical challenges

→ **No longer suitable for human market**

≠ **Municipal food waste**

Pinotti et al. (2018)



SFA: saturated fatty acid; PUFA: polyunsaturated fatty acid

Introduction – Feed Ingredients Used in Sow Lactation Diet

FA composition of the ingredients

	FFPs
g/kg (fresh)	
Fat	141.6
SFA	**73.5**
PUFA	14.4

Rich in SFA

- Dietary fat sources affect FA profile of sow milk
- ω-3 PUFAs improve
  - Immune system development
  - Piglet growth

(Pierzynowska et al., 2020)

Hypotheses

- FFPs and linseed cake lead to different FA profile in sow milk
- Possible negative impacts on piglet growth due to more abundant SFA from FFPs in sow milk

Objectives

- **Compare SFA-rich & PUFA-rich diet**
  - On
    - Sow performance
    - Sow milk quality
    - Litter performance
- Possibility to **replace 25 % classic ingredients** with FFPs in lactating sow's diet without impairing animal performance

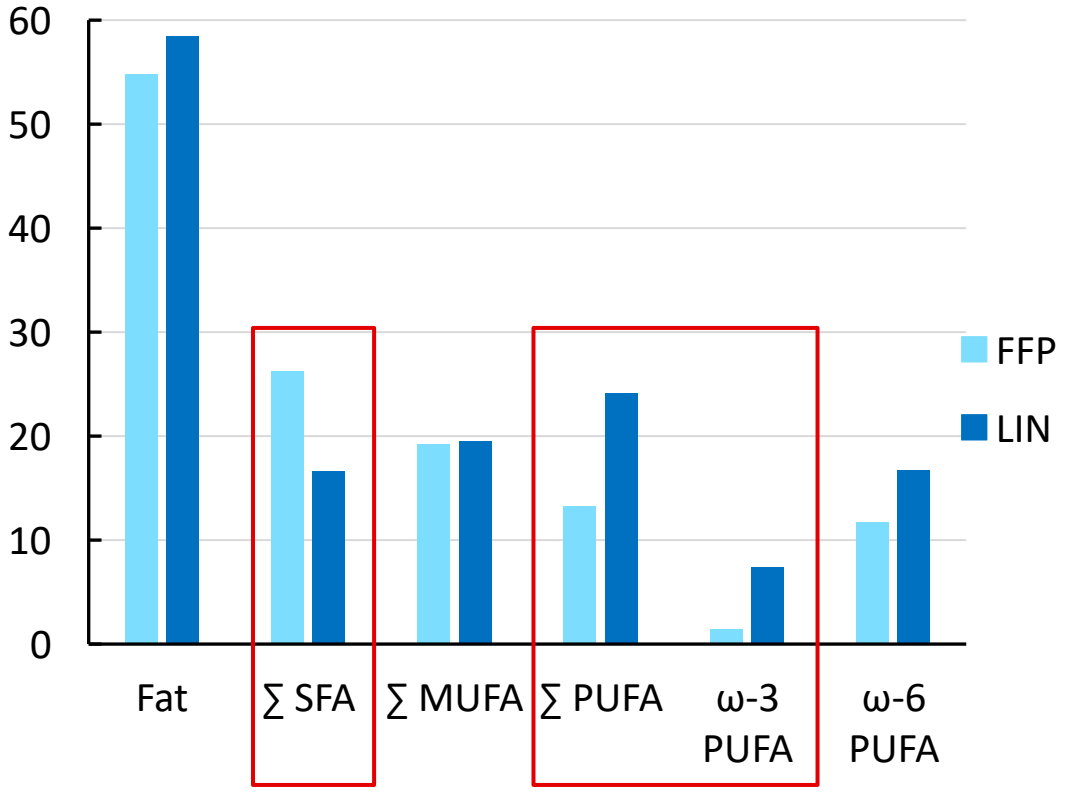
FA: fatty acid; SFA: saturated fatty acid; MUFA: monounsaturated fatty acid; PUFA: polyunsaturated fatty acid

Material & Methods – Diet Composition

Ingredients of lactation diets

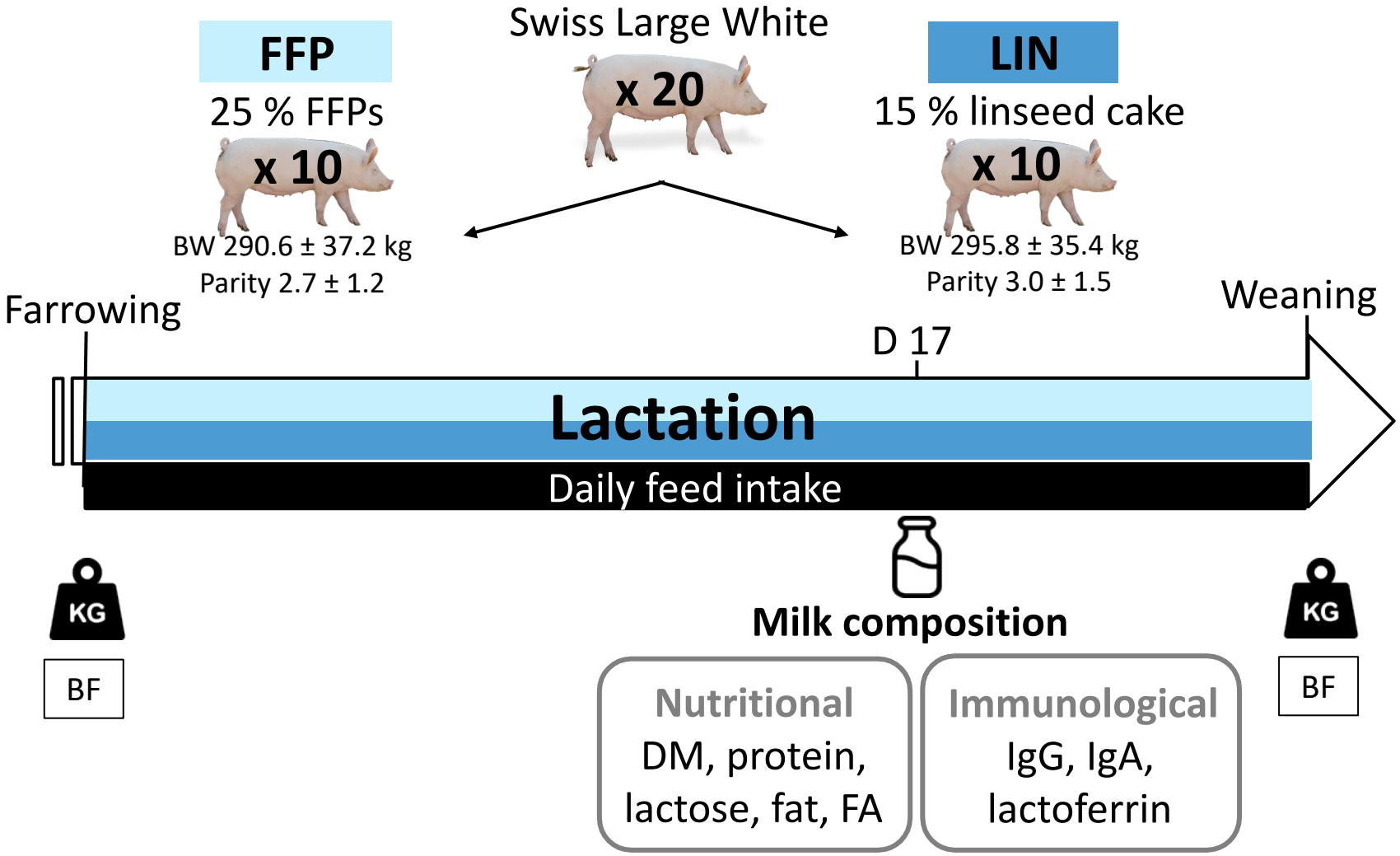
	Dietary Treatments	
Item	FFP	LIN
Ingredients (%)		
FFPs	**25.0**	–
Linseed cake	–	**15.0**
Corn, ground	–	25.0
Oat, ground	6.0	–
Soybean meal	4.7	–
Molasses	5.0	–
Wheat, ground	35.0	36.9
Animal fat	0.8	2.3
Potato protein	8.1	8.1
Dried beet pulp	9.6	7.3
L-lysine-HCL	0.3	0.3
DL-methionine	0.1	0.05
L-threonine	0.08	0.01
L-tryptophan	0.04	0.004
Mineral and vitamin	5.27	5.27

FA composition of lactation diets (fresh basis)



FA: fatty acid; SFA: saturated fatty acid; MUFA: mono-unsaturated fatty acid; PUFA: poly-unsaturated fatty acid

Material & Methods – Measurement & Sampling on Sow



Statistics
SAS (v9.4, Cary, NC, USA)

MIXED MODEL

REPEATED statement : repeated measurements

SLICE option : comparison within a day

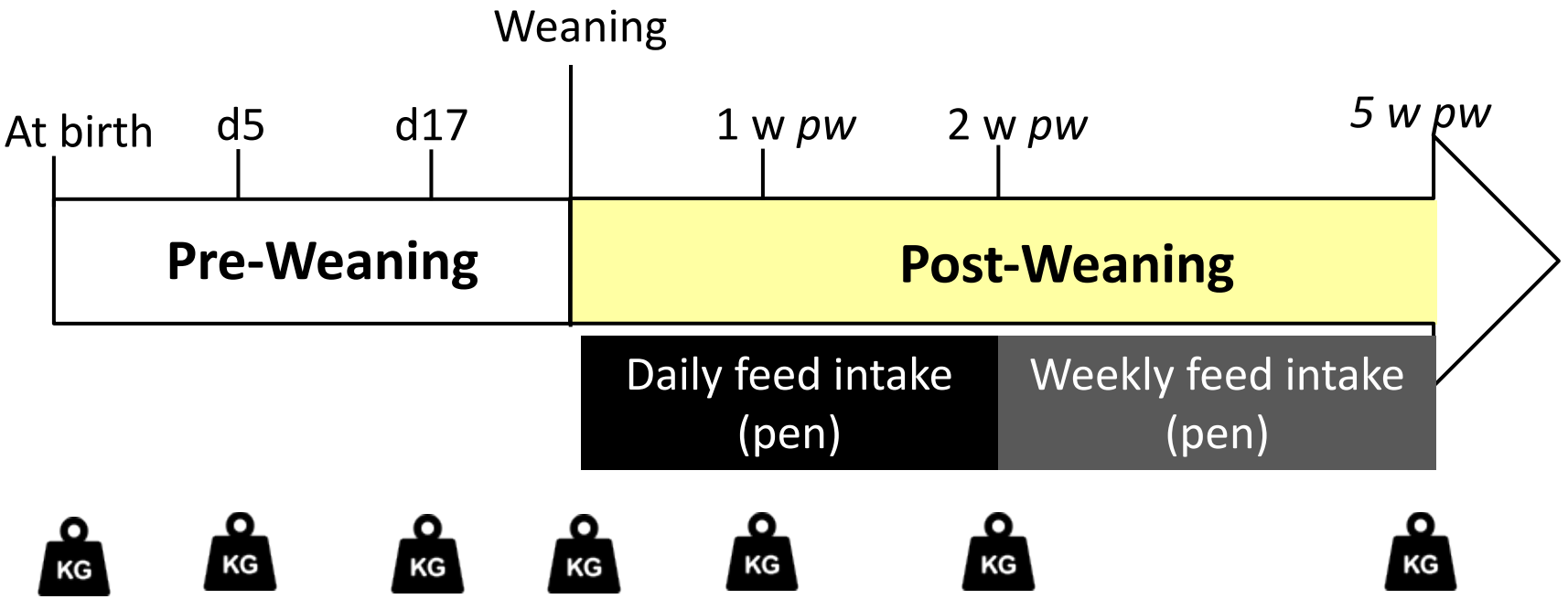
FIXED EFFECT: diets

BF: backfat thickness at P2 position; DM: dry matter; FA: fatty acid; IgG: immunoglobulin G; IgA: immunoglobulin A

Material & Methods – Measurement on Piglet

x 268

Standard starter diet



Statistics
SAS (v9.4, Cary, NC, USA)

MIXED MODEL

REPEATED statement : repeated measurements

SLICE option : comparison within a day

FIXED EFFECT: diets

RANDOM EFFECT: sows

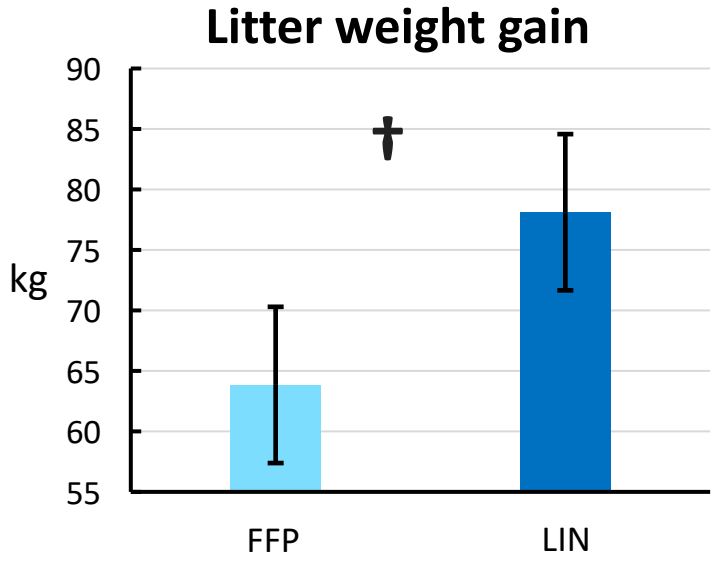
pw: post-weaning

Results – Sow Performance

P > 0.05

Item	Dietary Treatments		SEM	P-value
	FFP	LIN		
At weaning				
BW (kg)	215.62	235.07	15.524	0.33
BF (mm)	12.9	13.05	1.645	0.94
During lactation				
BW loss (kg)	34.38	25.98	7.384	0.37
BF loss (mm)	3.87	3.12	0.895	0.51

LIN
Better litter weight gain during lactation (tendency)



BW: body weight; BF: backfat thickness at P2 position

Results – Sow Feed Intake

$P_{diet} < 0.01$

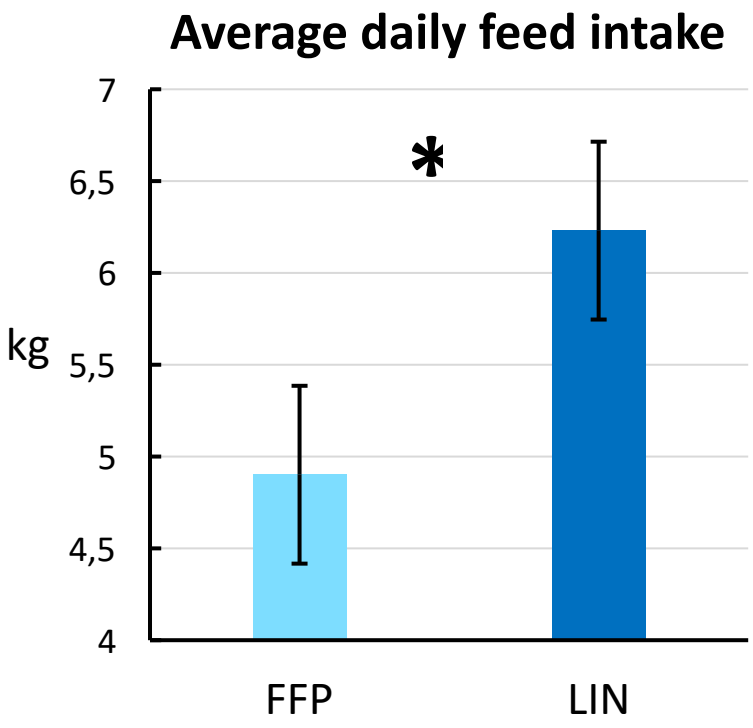
$P_{days} < 0.001$

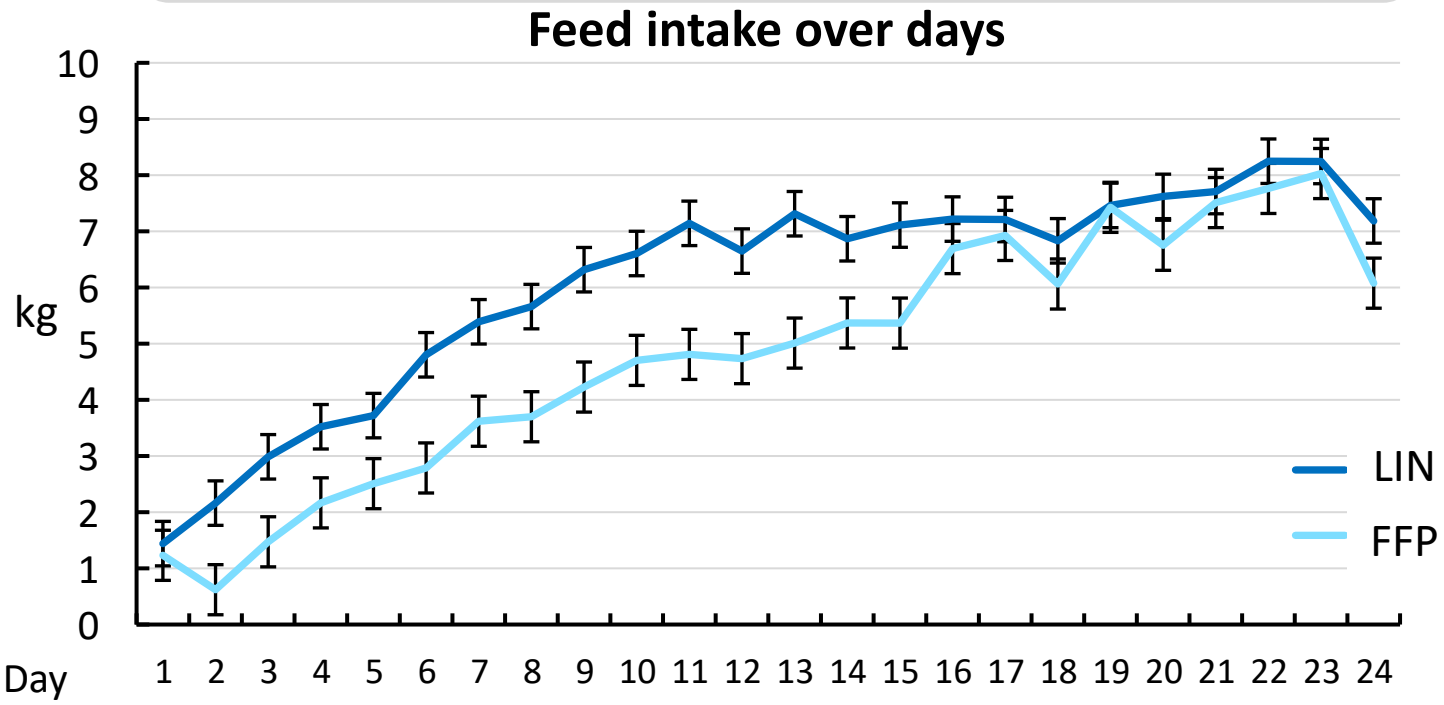
$P_{diet*days} = 0.30$

FFP < LIN

No Diet*Days effect

Throughout lactation, **FFP sows consumed less feed**





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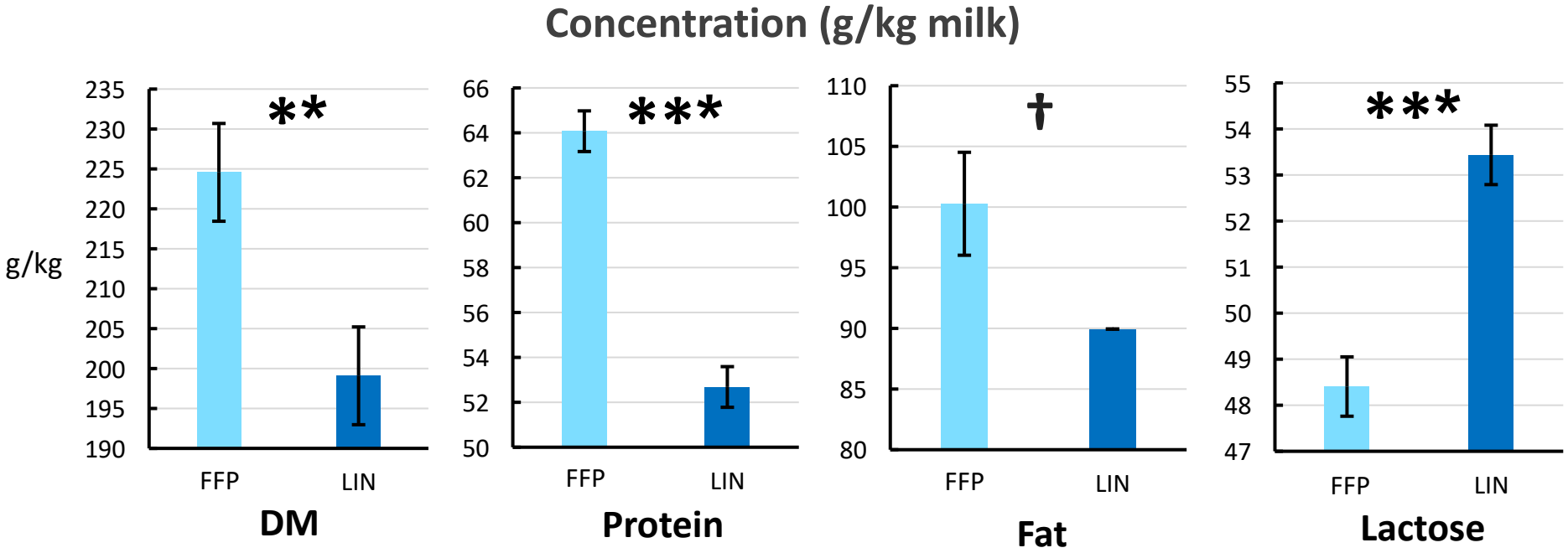
Results – Milk Composition D17

FFP > LIN

FFP < LIN



† P < 0.10; * P < 0.05; ** P < 0.01; *** P ≤ 0.001

DM: dry matter; VFA: valotile fatty acid

Results – Sow Milk Fatty Acid Profile

ω-3

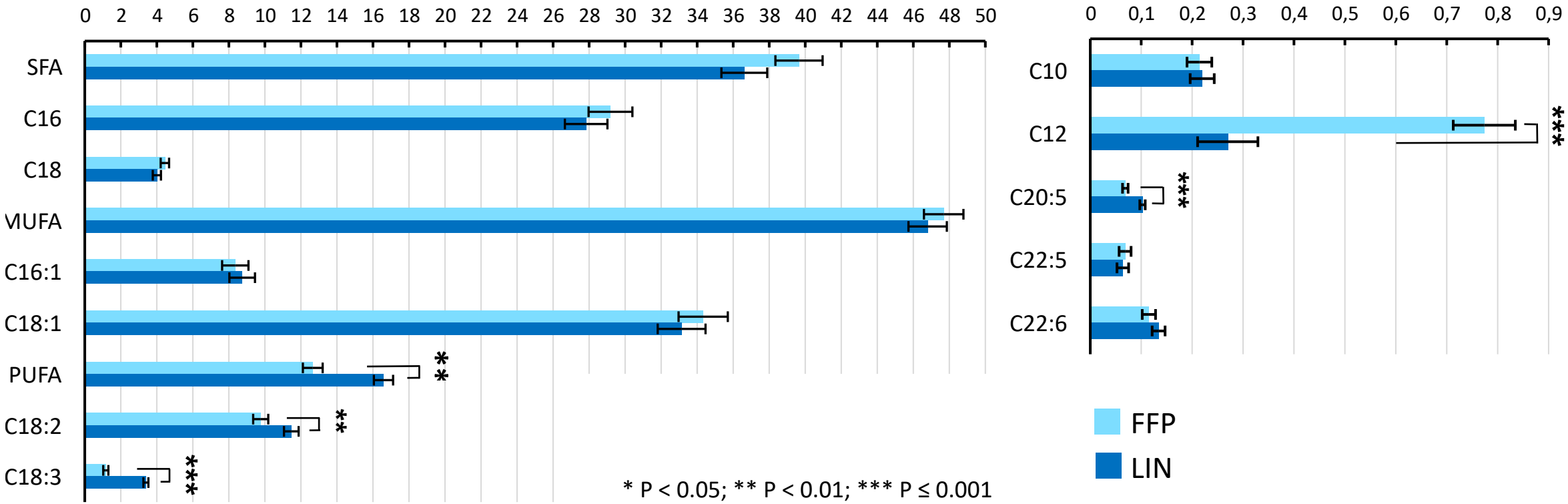
LIN ↑ ∑ PUFA, C18:2, C18:3, C20:5

Expressed as g/kg milk:

** **FFP↑ : ∑ SFA**

* **LIN↑ : ∑ PUFA, C18:3, C20:5**

FA profile (%)

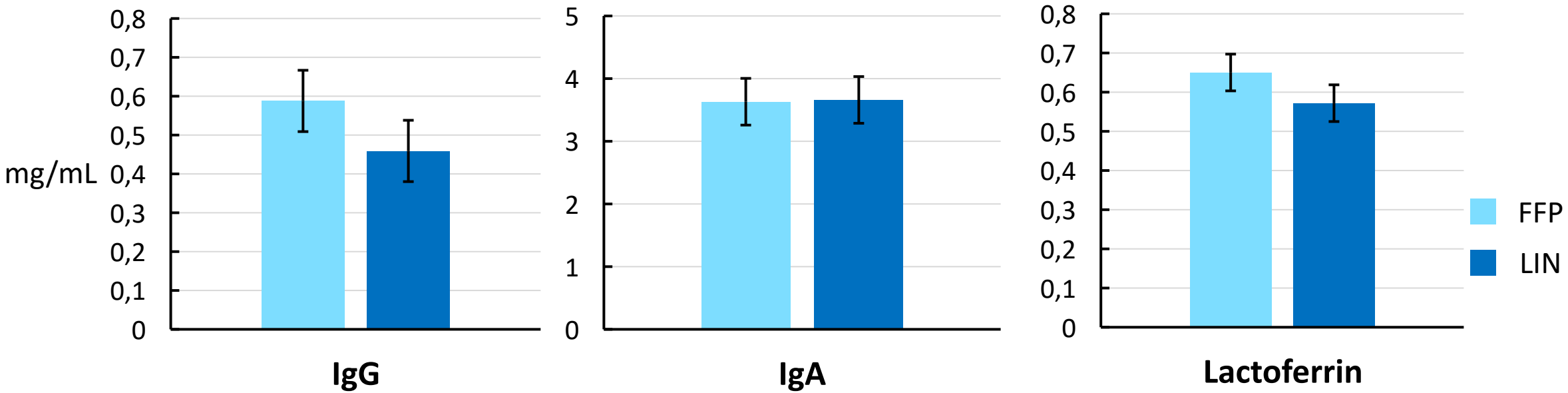


* P < 0.05; ** P < 0.01; *** P ≤ 0.001

FA: fatty acid; SFA: saturated fatty acid; MUFA: mono-unsaturated fatty acid; PUFA: poly-unsaturated fatty acid; C12: lauric acid; C18:2: linoleic acid; C18:3: alpha-linolenic acid; C20:5 eicosapentaenoic acid

Results – Immunoglobulin and Lactoferrin Contents in Milk D17

No dietary effect on IgG, IgA, and lactoferrin concentration



IgG: immunoglobulin G; IgA: immunoglobulin A

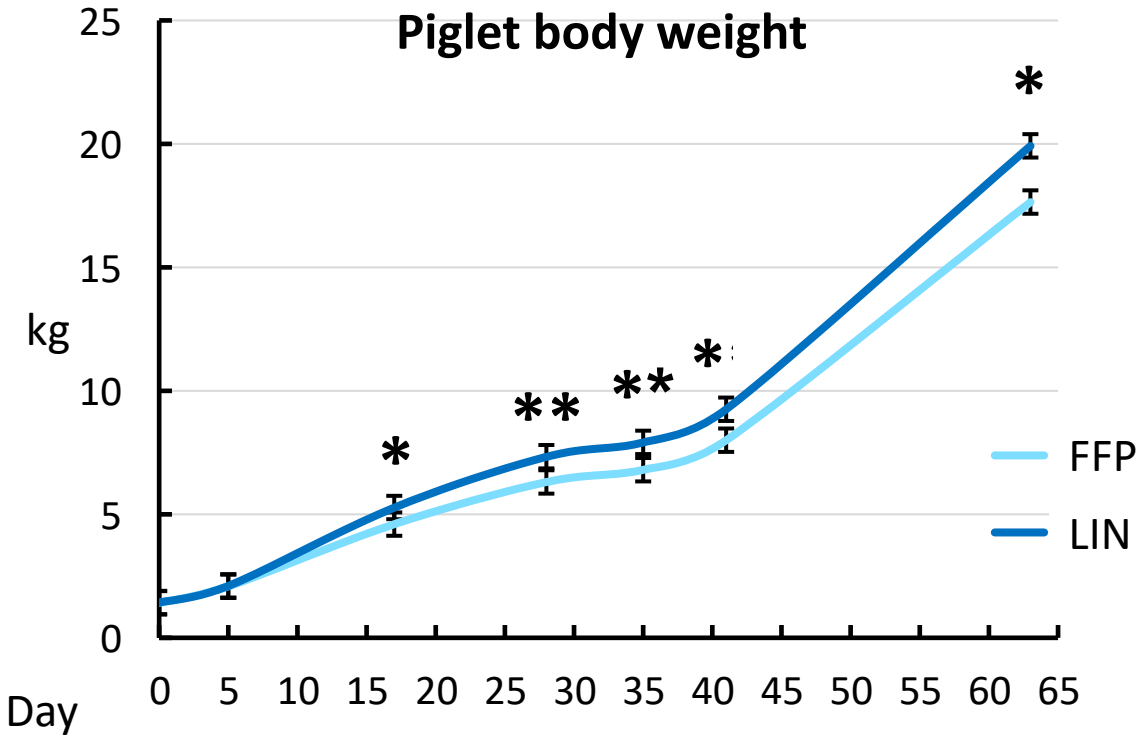
Results – Piglet Growth

$P_{diet} < 0.05$

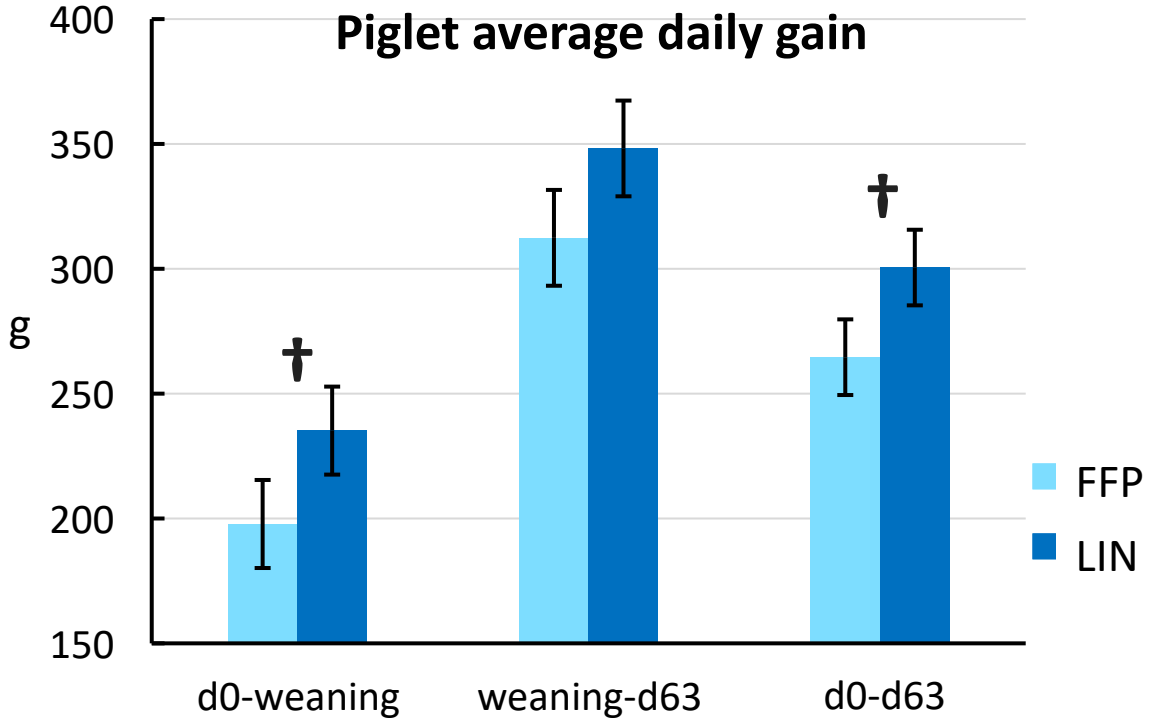
$P_{days} < 0.001$

$P_{diet*days} < 0.001$

FFP < LIN



FFP < LIN | No difference | FFP < LIN



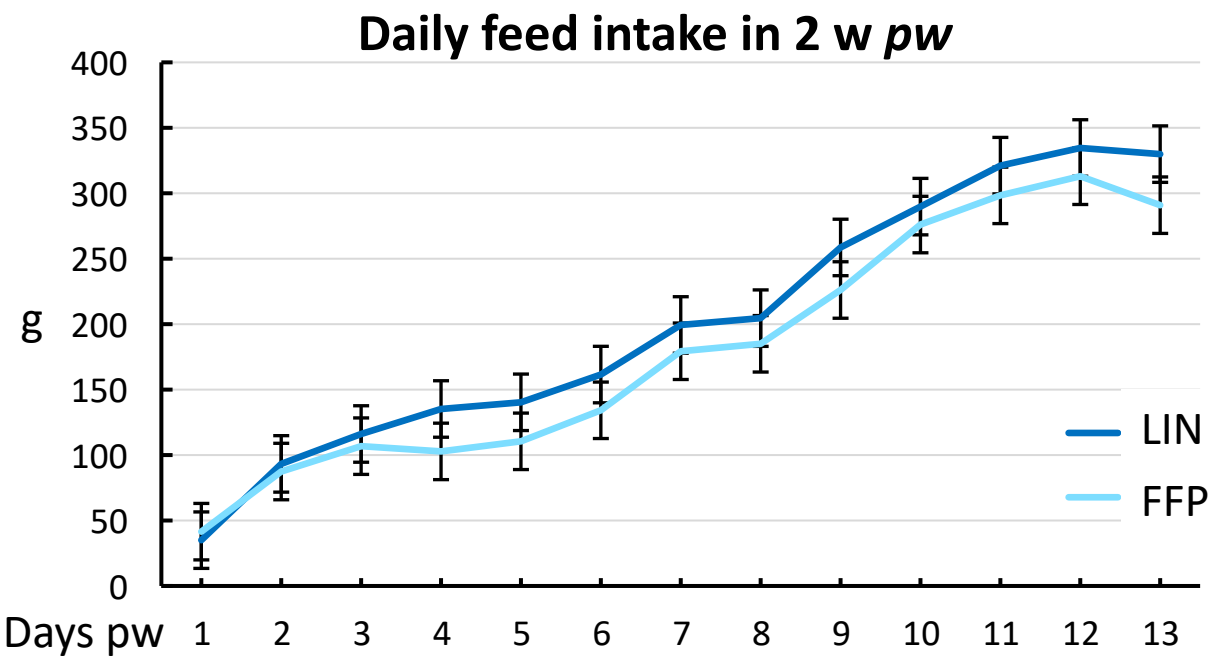
Data compared within a day : * P < 0.05; ** P < 0.01; *** P ≤ 0.001

Results – Piglet *PW* Feed intake

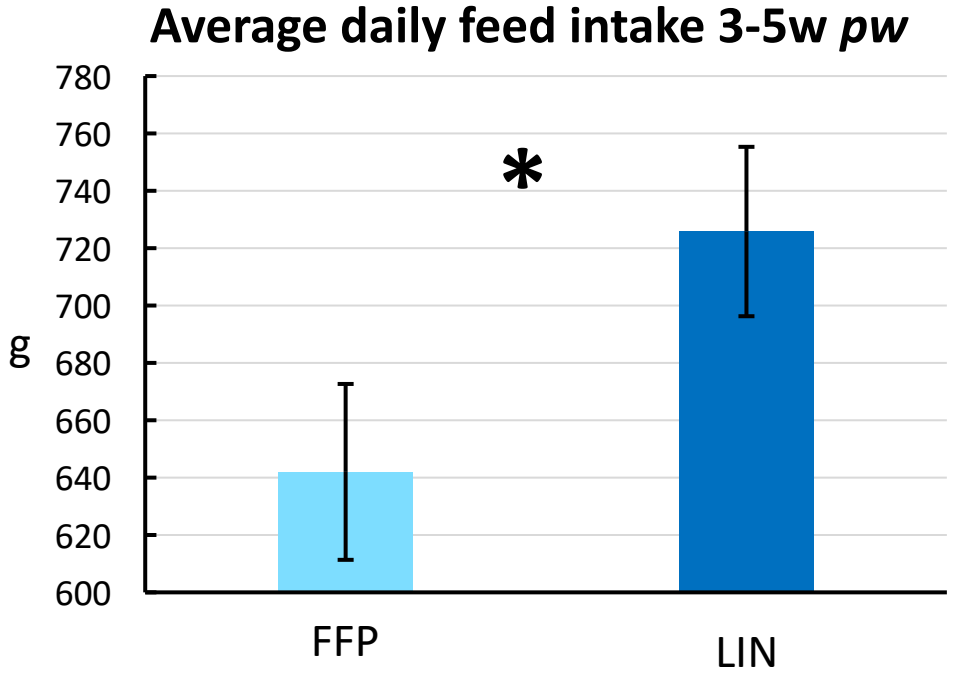
$P_{diet} > 0.05$

$P_{days} < 0.001$

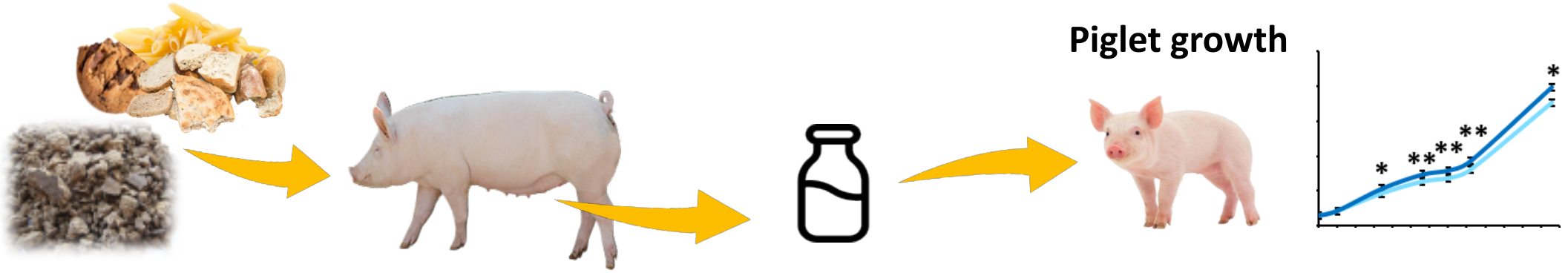
$P_{diet*days} > 0.05$



FFP < LIN



Conclusions



- 25% FFPs inclusion in lactation diet did not negatively affect sow body condition
- FFPs increased milk SFA content but decreased milk PUFA content

- Piglets from FFP group had a lower body weight from d17 of age and tended to grow slower

FFPs could partially replace traditional feed ingredients

But reduced inclusion level is recommended

Thank you !

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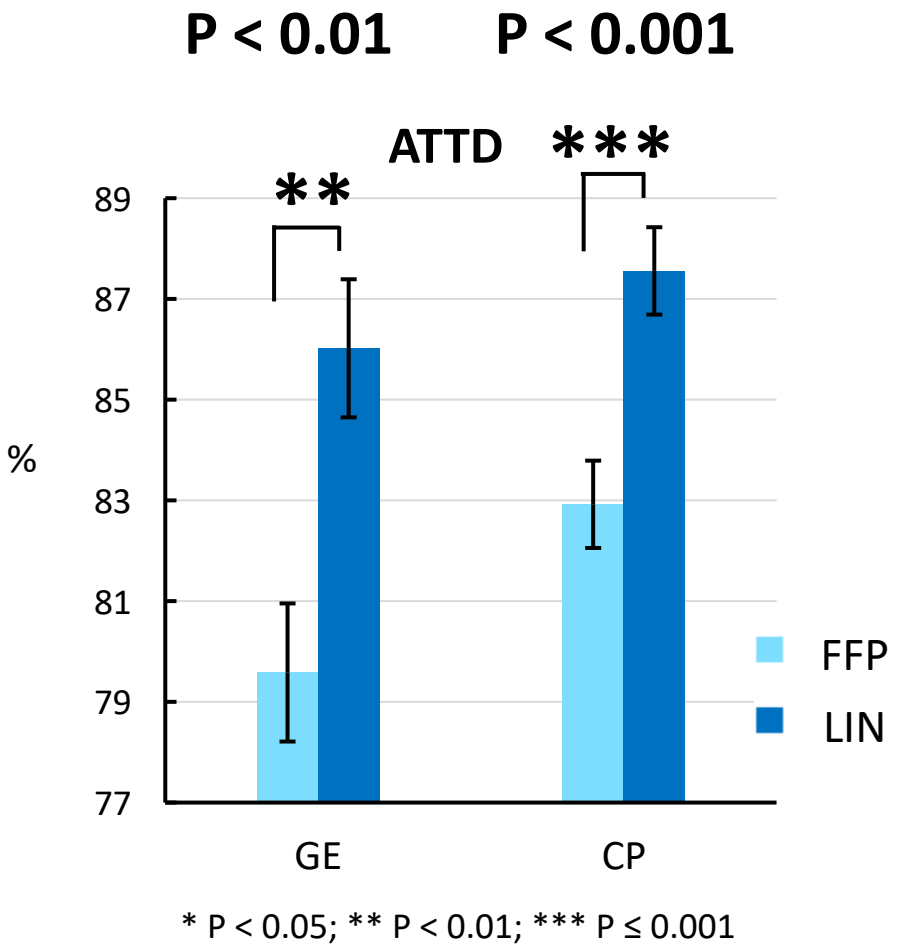
Results – Apparent Total Track Digestibility



Lower ATTD of GE and CP in FFP

ATTD (%)	GE	CP
FFP	**79.58**	**82.92**
LIN	86.02	87.56

ATTD: apparent total track digestibility; GE: gross energy; CP: crude protein

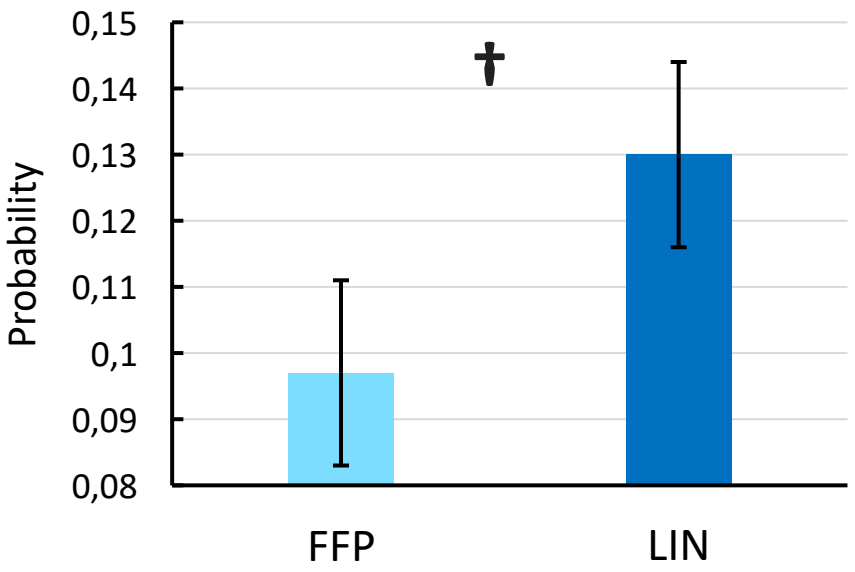
Results – Incidence of *PW* Diarrhea

FFP < LIN

No Diet*Days effect

No differece in average total days in diarrhea between FFP and LIN

Individual diarrhea occurrence



Diarrhea occurrence