Schothorst Feed Research

"Nutritional measures to improve viability, birth weight and uniformity of the litter"

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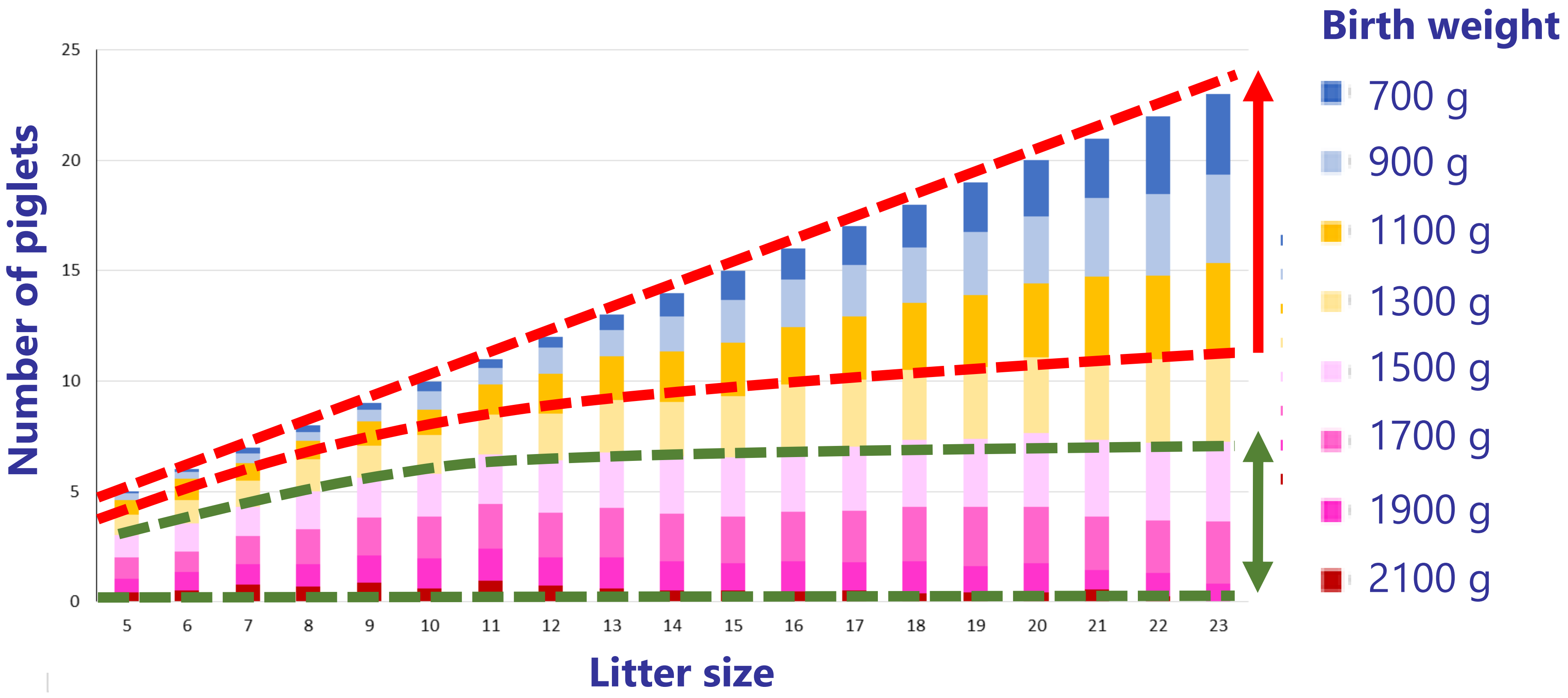
Genetic development sow - consequences

Bigger litters → more piglets with a low birth weight (<1100 g)



(SFR / 3113 litters / 2011-2015, unpublished)

Glucogenic energy during lactation

- Glucogenic energy can:
  - Increase milk production
  - **Improve follicle development**

- The objective of this study was to determine the effect of **dietary dextrose, starch or fermentable carbohydrates** during the last week of lactation and during the weaning to oestrus interval (WOI) on birth weight and uniformity within a litter.

Treatments

	Diet per period			
Description	**Last week lactation**	**WOI**	Gestation	Lactation
Control	**A + 225 g/d maize**	**A**	Commercial	Commercial
Dextrose	**A + 175 g/d dextrose**	**B**	Commercial	Commercial
Sugar beet pulp	**A + 225 g/d maize**	**C**	Commercial	Commercial
Expanded maize	**A + 225 g/d expanded maize**	**D**	Commercial	Commercial

- Last week lactation: Sows in the dextrose treatment received **175 gram dextrose** based on Van der Brand et al., (2009) who fed 25 g/kg dextrose during lactation. The other treatments received **225 gram topdressing of maize (T1) or expanded maize (T4).** The 225 gram of maize or expanded maize was based on the amount of glucogenic units in 175 gram dextrose.
- WOI: The control diet (diet A) was formulated based on SFR recommendations of lactation sows. Diet B had an inclusion rate of 4.5 % dextrose based on Van der Brand et al. (2009). Diet C had an inclusion of 20% sugar beet pulp. Diet D had an inclusion of 5.8% expanded maize.
- All diets were formulated to be **isocaloric.**

Experimental set up

- 60 sows; parity 2-5 at start of experiment

- Blood glucose, insulin and IGF-1 levels during WOI
- Follicle size during WOI
- Sow and litter performance in *subsequent cycle*

Weaning	d1	d2	d3	d4	d5	d6
	IGF	IGF	IGF	IGF	IGF	
		glucose/Insulin [1]				
Scanning [2]			scanning	scanning	scanning	scanning

[1] Blood samples for glucose and insulin concentrations on day 2 after weaning were taken at -12, 0, 12, 24, 36, 48, 60, 84, 120, 156, 240 and 360 minutes after feeding.
[2] The follicle diameter was defined as the mean diameter of the two largest follicles present. The follicle diameter at ovulation was defined as the mean diameter of the two largest follicles at the last scanning.

Dietary treatment had no effect on feed intake

Treatment	T1 Control	T2 Dextrose	T3 SBP	T4 Extruded maize	LSD	P-value
Feed intake (kg/d)						
D21 lactation -insemination	4.6	4.5	4.4	4.5	0.22	0.39
Gestation	2.8	2.8	2.7	2.8	0.06	0.45
Subsequent lactation	5.7	5.6	5.7	5.7	0.34	0.88
Body weight development (kg)						
D21 lactation -insemination	-22.7	-19.1	-23.9	-21.5	5.39	0.33
Gestation	55.7	60.5	55.3	56.4	7.06	0.42
Subsequent lactation	-41.0	-41.0	-37.3	-45.2	9.23	0.41
Back fat development (mm)						
D21 lactation -insemination	-1.13	-0.81	-1.54	-1.63	0.921	0.25
Gestation	3.56	4.67	4.23	3.64	1.424	0.34
Subsequent lactation	-2.93	-4.42	-3.08	-3.29	1.543	0.21

Dietary treatment had no significant effect on feed intake or body weight and backfat development of the sows.

Effect treatment on insulin level

Treatme	-value
Insuli	
Basal lev	0.81
Maximu	*0.05*
Increase	*0.04*
Mean le	0.06
AUC360,	*0.05*

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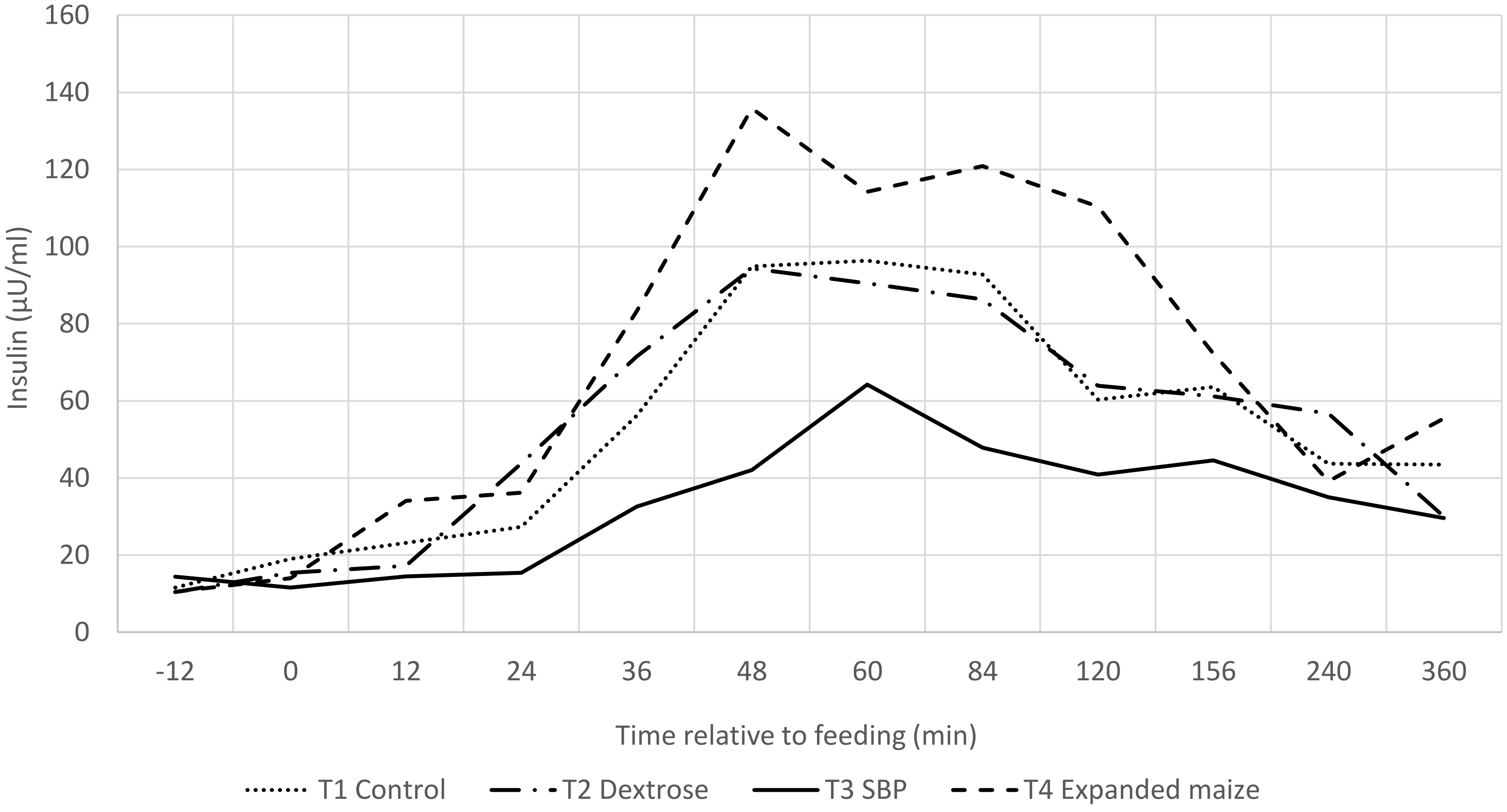
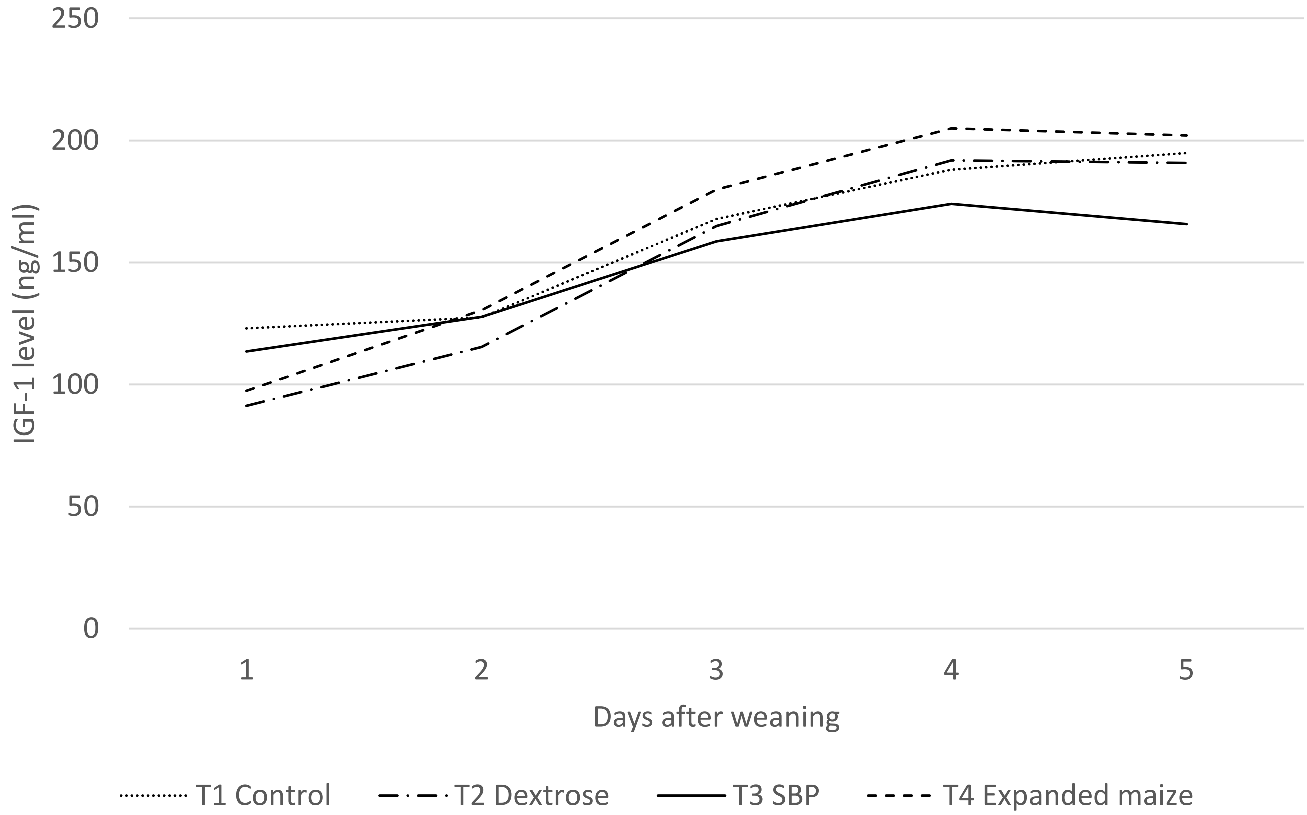


Glucose levels were constant due to an immediate response of insulin. Extruded maize had a significant higher insulin peak and AUC after feeding.

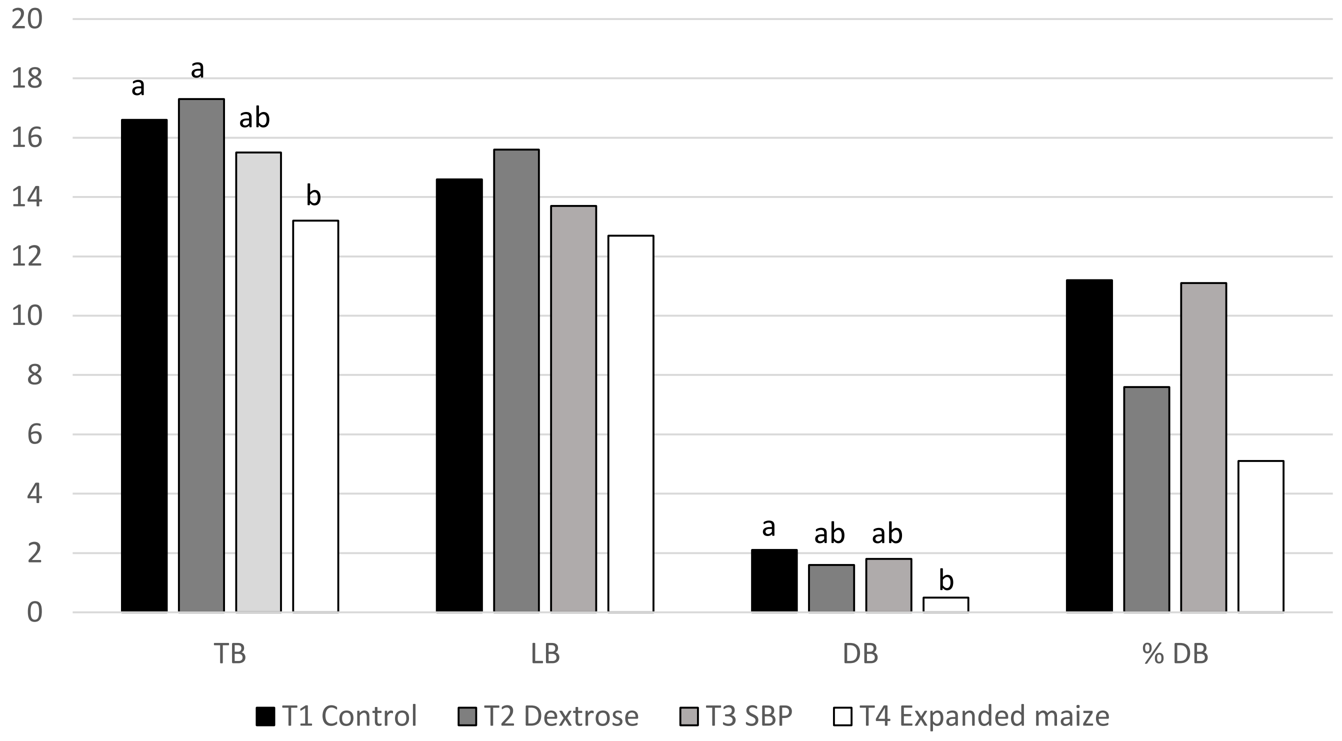
IGF-1 levels and foollicle development did not respond as expected



Treatment	T1 Control	T2 Dextrose	T3 SBP	T4 Extruded maize	LSD	P-value
ISB, days	5.1	5.1	5.1	5.2	0.28	0.65
Follicle size on d4 after weaning, mm	5.9	5.7	5.8	5.4	1.19	0.83
Follicle size at ovulation, mm	6.4	6.3	6.5	6.4	0.65	0.94

Dietary treatment did not affect IGF-1 levels between weaning and insemination or follicle size .

Negative effect of extruded maize on litter size (TB) in subsequent cycle



Extruded maize had a significant lower TB (*P*=0.02), but also a lower DB (*P*=0.05). No effect on % DB was observed.

Extruded maize resulted in higher weaning weight in subsequent cycle.

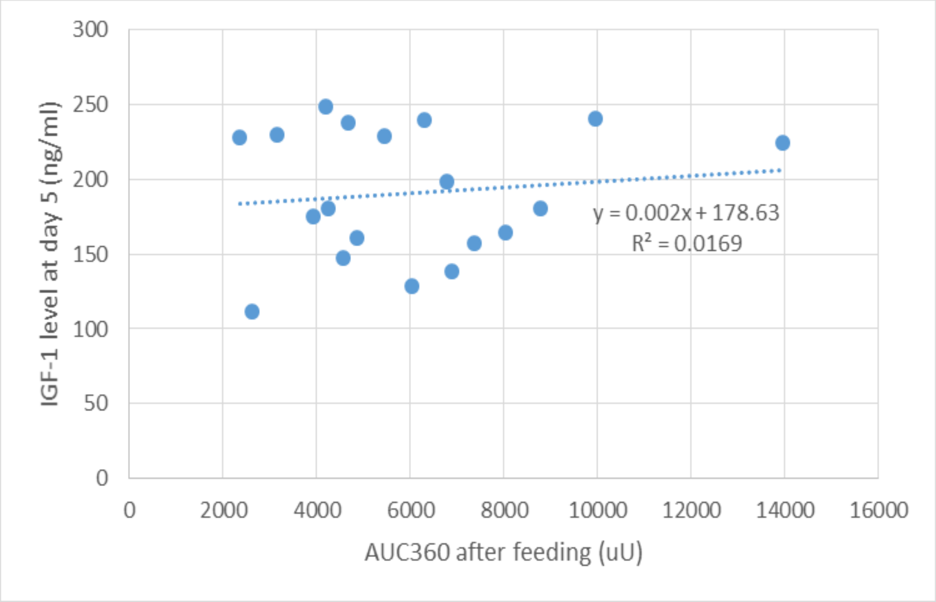
Treatment	**T1** Control	**T2** Dextrose	**T3** SBP	**T4** Extruded maize	**LSD[1]**	**P-value**
Birth						
Piglet weight [2] (g)	1299	1168	1157	1209	247.3	0.57
CV Birth weight [2] (%)	22.9	23.4	23.6	26.0	6.34	0.77
Litter weight [2] (kg)	19.0	19.1	17.6	15.4	4.50	0.32
Weaning						
Weaning weight [3] (g)	7760 [a]	7742 [a]	7910 [a]	8520 [b]	519.1	*0.02*
Weaning weight litter [3] (kg)	85.7	82.8	83.2	83.2	21.48	1.00
Pre-weaning ADG [3] (g/d)	250 [a]	250 [a]	257 [a]	276 [b]	17.83	*0.02*
Pre-weaning mortality [3] (%)	8.7	14.4	12.0	5.9	8.39	0.19

[1] LSD is least significant difference at $\alpha<0.05$, [2] These parameters were corrected for the number of total born piglets.
[3] Corrected for the number of piglets at start and age at weaning.

Insulin stimulating diets showed no positive effect on birth weight or uniformity. Extruded maize showed a higher growth till weaning (P=0.02) and a higher weaning weight (P=0.02). However, this is an effect of the lower litter size and higher piglet weight at birth.

Conclusions

- In this experiment insulin stimulating diets had:
  - – An effect on insulin peak/AUC after feeding
  - – No effect on IGF-1 during WOI
  - – No effect follicle development during WOI
  - – No positive effect on TB or birth weight

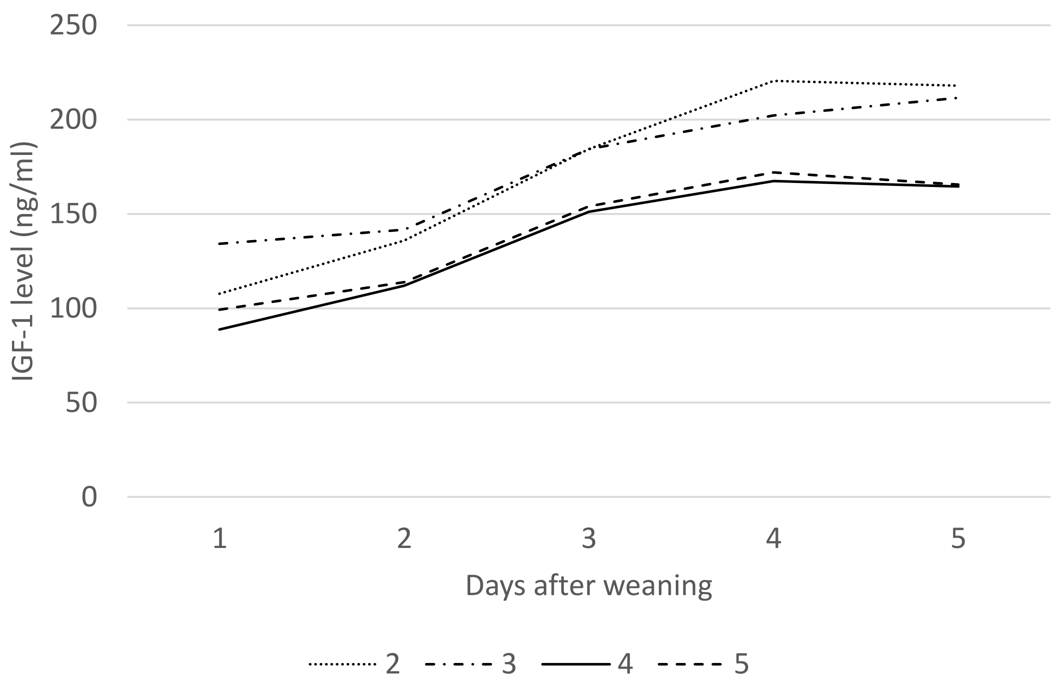


- IGF-1 levels were not correlated to insulin peak/AUC after feeding

- However, these results are contradicting the positive effects found in literature
  (Van den Brand et al., 2001; Quesnel et al., 2007; Quesnel, 2009)

Why no response?

- In literature most experiment are done with young sows (P1) in contrast to the sows in this experiment; parity 2-5 (ave 3.4)
- The metabolic status of the sow determines the level of response of IGF-1 -> catabolic = bigger effect
- Young sows loose more body weight (%) during lactation and will, therefore, be “more catabolic” than multiparous sows.



Catabolic vs anabolic sows

- Catabolic sows = high BW loss during lactation
  - Low FI lactation
    - Parity
    - Temperature (heat stress)
    - Health
  - Management rearing gilts
    - Insufficient development during rearing phase/first gestation
- So…….insulin stimulating diets only have a positive effect on follicle development and uniformity in sows with suboptimal follicle development
    - Young sows
    - Sows with a low FI

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Thank you for your attention

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