IPVS 2014 digest

"Management"

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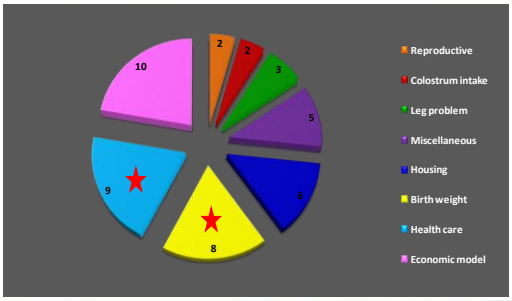
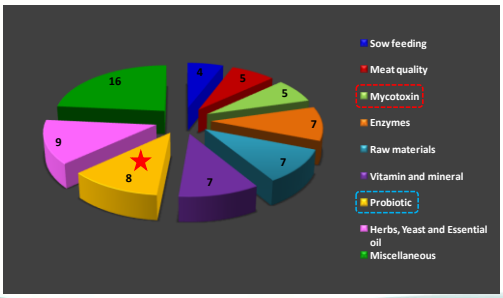
Categorization

Topic	Oral + Corner	Poster	Total
Welfare	10	23	33
Meat Quality	3	10	13
Practitioner Line	26	38	64
Management	10	35	45
Nutrition	18	50	68
Genetics	7	32	39
Miscellaneous	32	56	88
Total	106	244	350

Management (45 topics)



Nutrition (68 topics)



Management (Keynote)

- **Managing a pig production system using science-based, systems measurement.**

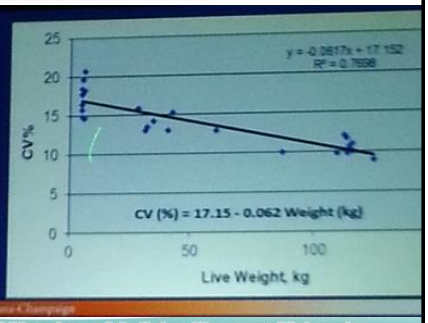
Bradley Wolter, PhD., Department of Animal Science, University of Illinois.

- ❖ **Quality management**
- ❖ **Monitoring (recording system)**

Strategic measures

- **Quality Carcass Weight/Sow/Year**
- **CV in Weight of Carcasses/Year**
- **Sales Premium/Unit of Carcass Weight**
- **Facility Cost/Unit of Carcass Weight Produced**
- **Unit of Feed Used/Unit of Carcass Weight Produced**

Changes in Within-Pen oefficient of /ariation in Veight with ncreasing ive Weight



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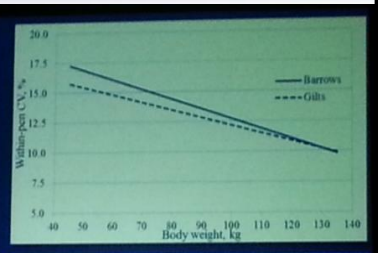
Within-Pen Coefficient of Variation in Live Weight (Shull, 2013)



Barrows: CV (%) = 21.0 - 0.083 BW; R^2 = 0.95

Gilts: CV (%) = 18.7 - 0.065 BW; R^2 = 0.96

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Evolution of sow productivity in a Brazilian farm during the last twenty years (Aparicio et al., 2014)

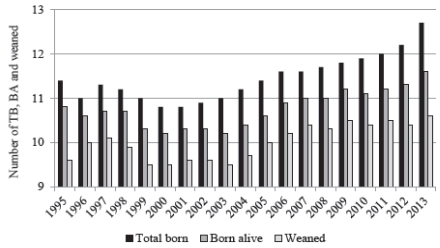

Figure 1. Evolution of total born (TB), born alive (BA) and weaned piglets per litter in 1995 - 2013.

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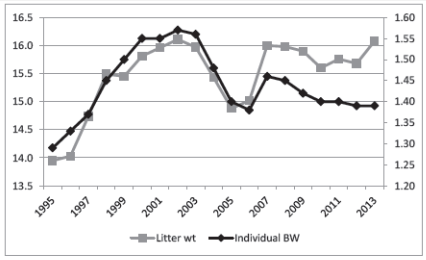

Figure 2. Evolution of individual body weight and litter weight (kg) at birth 1995-2013

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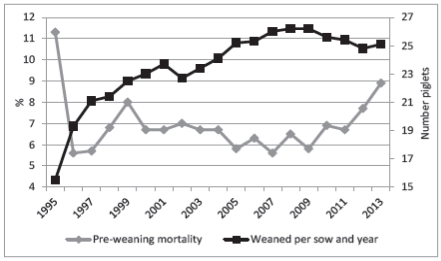

Figure 3. Evolution of pre-weaning mortality and number of piglets weaned per sow and year in 1995-2013

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Birth weight variation

- **Birth weight effect on …….**
  - **Growth performances ????**
  - **Meat Quality ????**
  - **Mortality rate ????**
  - **Reproductive in gilt ????**
  - **Immune and diseases status ????**

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Low birth weight piglets

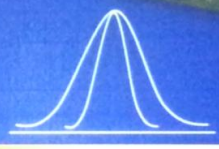
- High mortality and compromised post-natal development
- Decrease growth rate, muscle accretion, and compromised intestine morphology

(Alvarenga et al., 2013)

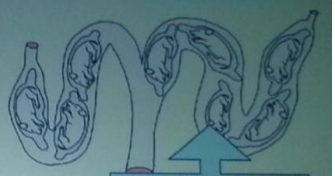
Genital tract development

Causes of Variation in Weight

- Animal factors:
  - Age range in the population.
  - Genetics.
  - Sex.
  - Birth weight.
- Environmental factors:
  - Nutrition.
  - Effective environment.
  - Health status.



Fernanda et al., 2014



- Physiologically compromised (energy reserves, thermoregulatory capacity);
- Colostrum intake: low and delayed;
- Competitive disadvantage: finding a teat.

Ashworth, 2013

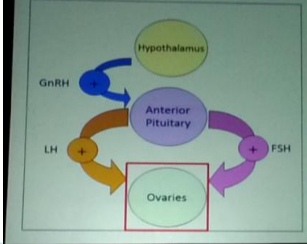
Altered growth in utero

Development of reproductive disorders later in life:

- Altered timing of onset of puberty;
- Reduced size of uterus and ovaries;
- Earlier menopause

Altered fetal reproductive organogenesis

Gonadotrophic Axis



- Germ cells: Migration, proliferation, degeneration and meiosis;
- Folliculogenesis

Follicle population at birth

Number of follicles recruited postnatal life

Materials and Methods

- 64 new-born female pigs TOPIGS genotype (born to first parity, litters 10-15 pigs) identified
- Two birth weight groups: HBW (1.5 ± 0.2 kg), LBW (1.0 ± 0.2 kg) littermates
- Slaughtered at a fixed age (Age Group, AG: 80.8 ± 1.2 days) or at a fixed body weight (Weight Group, WG: 35.2 ± 1.4 kg)

Results: Ovarian and hormonal data

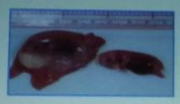
Parameter	Age			Weight		
	LBW	HBW	s.e.m	LBW	HBW	s.e.m
Age, d	-	-	-	82.9 [a]	77.0 [b]	1.20
BW, kg	34.50 [a]	40.10 [b]	1.60	-	-	-
OW, g	0.32 [a]	0.39 [a]	0.10	0.41 [a]	0.26 [a]	0.11
Foll 1mm	0.00 [a]	0.12 [a]	0.10	0.30 [a]	0.03 [a]	0.21
Foll 2mm	0.50 [a]	0.32 [a]	0.20	1.00 [a]	0.23 [a]	0.60
Foll 3mm	0.46 [a]	1.14 [a]	0.50	0.21 [a]	0.90 [a]	0.35
Leptin, ng/mL	2.74 [a]	2.69 [a]	0.08	2.82 [a]	2.76 [a]	0.08
IGF-1, ng/mL	350.4 [a]	341.6 [a]	15.4	293.9 [a]	340.7 [a]	18.6

[a,b] $P < 0.05$

Conclusions

At least in prepubertal gilts, our results suggest that follicular dynamics in LBW and HBW animals are equivalent. More research is necessary to address further reproductive capacity in LBW and HBW females, as birth weight may be an important parameter to include in dam line breeding programs.

Placenta



Limited placental development

Intra-uterine crowding

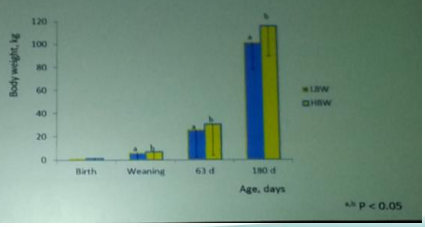
IUGR

Great competition for nutrient and O_2

Materials and Methods

- 38 new-born female pigs TOPIGS genotype (born to first parity, litters 10-15 pigs) identified
- Two birth weight groups: HBW (1.5 ± 0.3 kg), LBW (0.9 ± 0.3 kg) littermates
- They were weighed regularly
- Daily estrus detection began at ~140 d until onset of estrus

Results: Body weight data



[a,b] $P < 0.05$

Results: Biometrical data

Parameters	LBW (n=19)	HBW (n=19)	P value
Age at puberty, days	178.0 ± 4.1[a]	172.4 ± 4.1[a]	NS
Body weight, kg	102.4 ± 3.1[a]	117.6 ± 3.1[b]	< 0.05
Backfat, mm	8.9 ± 0.4[a]	9.1 ± 0.4[a]	NS
Mean ovarian weight, g	8.9 ± 0.4[a]	9.1 ± 0.4[a]	NS
Ovulation rate	14.5 ± 0.5[a]	15.0 ± 0.5[a]	NS

Results: Biometrical data

Parameters	LBW (n=19)	HBW (n=19)	P value
Vaginal length, cm	11.0 ± 0.6[a]	12.1 ± 0.6[a]	NS
Uterine horn length, cm	85.8 ± 2.1[a]	88.8 ± 2.1[a]	NS
Oviduct length, cm	21.6 ± 0.7 [a]	23.3 ± 0.7 [a]	NS

Results: Hormonal data

Parameters	LBW (n=19)	HBW (n=19)	P value
Leptin at d 80, ng/mL	2.3 ± 0.2[a]	2.6 ± 0.2[a]	NS
IGF-I at d 80, ng/mL	334.6 ± 12.1[a]	345.2 ± 12.1[a]	NS
Leptin at slaug, ng/mL	3.5 ± 0.2[a]	3.7 ± 0.2[a]	NS

Conclusions

- Although birth weight affects postnatal growth performance, its effects on the reproductive tract development are minor.
- Leptin and IGF-I may directly affect puberty attainment.

ForFarmers, 2014

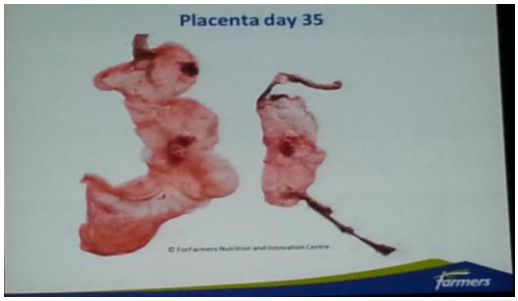
Introduction

- Low birth weight associated with
  - Increased mortality (Wolf et al. 2008; Opschoor et al. 2012)
  - Increasing time to reach market (Beaulieu et al. 2010; Opschoor et al. 2012)
- Increasing litter size
  - > Lower birth weight (Wolf et al. 2008; Beaulieu et al. 2010)

Weight class % Kg (n = 1022)	<25% <1,080	25-50% 1,10-1,26	50-75% 1,28-1,45	>75% >1,46	P
Birth weight (kg)	0,90	1,18	1,36	1,62	
Pre weaning mortality(%)	36,8[a]	10,0[b]	9,7[b]	8,0[b]	<0,001
Market age (days)	184[a]	181[b]	179[b]	177[c]	<0,05
Carkass weight (kg)	85,8[a]	87,5[ab]	88,7[bc]	90,0[c]	<0,05

Source: ForFarmers 2014, unpublished

Placenta day 35

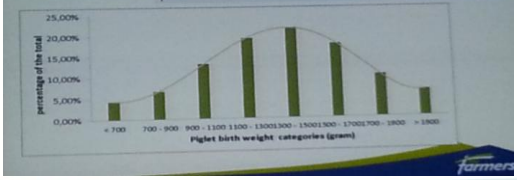


Fetal development

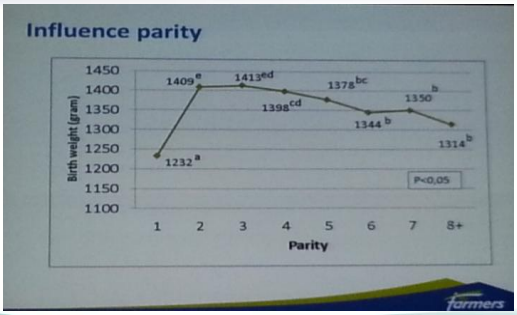
- Ovulation
- Elongation of the blastocyst
- Development of the placenta
  - Development until day 35 well correlated with birth weight!
  - Dependant of follicle development before and after weaning
  - Feeding strategy farrowing house and after weaning

Descriptive statistics

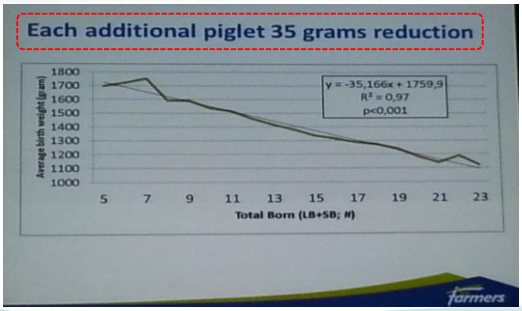
n = 113.329	Number of piglets	Average weight
TB	14,77	1340 grams
LB	13,76	1357[a] grams
SB	1,02 (6,9%)	1093[b] grams
p		<0,001



Influence parity



Each additional piglet 35 grams reduction



Birth weight

- **Birth weight effect on …….**
  - **Growth performances ➡ Yes**
  - **Meat Quality ➡ Yes**
  - **Mortality rate ➡ Yes**
  - **Reproductive in gilt ➡ Minor**
  - **Immune and diseases ➡ ????**

How do we reduce %PWM of light weight piglets?

- **Hormonal techniques**
  - GnRH : Stephen et al., 2014
  - Altrenogest: Kitkha et al., 2014
- **Intensive care**
  - Vichitvanichpong et al., 2014
  - Astorga and Martin, 2014
  - Voisin et al., 2014
- **Feeding technique**
  - Martinez et al., 2014
  - Borbolla et al., 2014

Effect of management practices on infection dynamic of PRRSV in vaccinated farrow-to-finish herds (Czyżewska et al., 2014)

- PRRS MLV vaccinated herds (A and B)
- In herd A high biosecurity program
- In herd B all-in-all-out practice was abandoned
- Serum samples were taken from 10 animals per age category
- PRRSV commercial ELISA were used: PRRS X3 ELISA test kit (IDEXX)

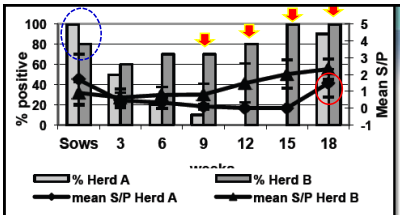


Figure 1. Serum profile of PRRSV in herd A and B

Table 1. Comparison of mean S/P ratio value per age category in herd A and B

Age group	mean S/P		p value
	A	B	
Sows	1,685	0,912	0,473
3 weeks	0,455	0,628	0,427
6 weeks	0,318	0,786	0,037
9 weeks	0,098	0,813	0,000
12 weeks	0,005	1,496	0,000
15 weeks	0,007	2,024	0,000
>18 weeks	1,490	2,315	0,045

Control of water consumption in swine barns; one step-closer to real time management (Piñeiro et al., 2014)

- 1,000 pigs were allotted 10 pigs/pen
  - —0.70 m^2/pig
  - —natural ventilation
  - —partly slatted
  - —one hopper and cup drinker/pen
  - —Feed and water were available *ad libitum.*

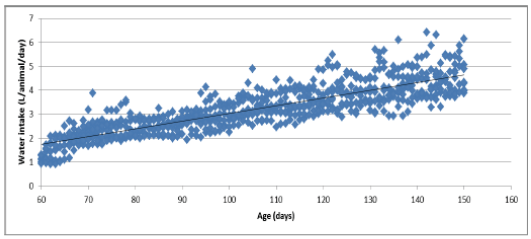


Figure 1. Linear regression of water consumption versus age of fattening pigs

Reducing improper handling during farrowing improves performance in lactation period (Díaz et al., 2014)

Table 1. Farrowing data (Number per farrowing) before and after training of workers

	Born alive	Stillborn	Total born	Weaned piglets
Before	12.97	1.01	14.10	9.06
After	12.29	0.90	13.37	9.92
SEM[1]	*0.315*	*0.155*	*0.346*	*0.166*
P[2]	*t*	*NS*	*t*	*****

[1]Standard Error of Mean; [2]Probability: NS, P>0.10; t, P<0.10; ***, P<0.001

Refreshing

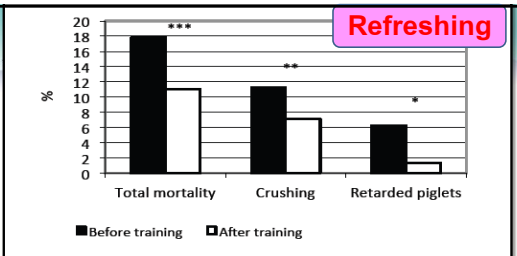


Figure 1. Total % of pre-weaning mortality and of the main causes before and after training of workers

- assistance during the Farrowing (33.5% vs 9.7%, P< 0.01)
- sows which required an antibiotic (38.6% vs 25.0%, P<0.05)

Effect of sow lameness on herd throughput (Deen et al., 2014)

- An economic model was built to simulate production during one breeding cycle.
- Breeding groups in a herd with an overall prevalence of approximately 20% lameness.
- Production outputs were estimated based on expected performance and piglets were valued based on quality at weaning.

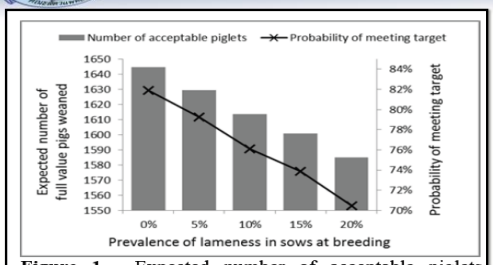


Figure 1. Expected number of acceptable piglets weaned and likelihood of meeting target when lameness is reduced in a swine herd

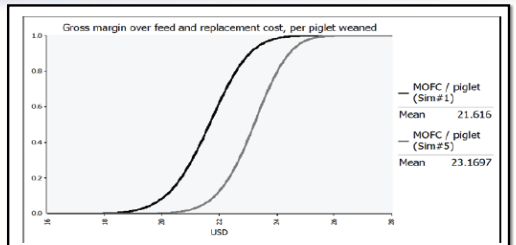
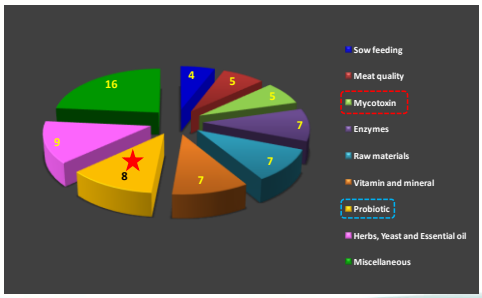


Figure 2. Cumulative distributions of margin over feed and replacement net costs when lameness is reduced from 20% (darker line) to 0%

Nutrition (68 topics)



Nutritionally induced cellular signals that affect skeletal integrity in swine. (Keynote)

- **Thomas Crenshaw, DVM, PhD.**
  (Department of Animal Science, University of Wisconsin-Madison)
- **The percent ash varies from 62 to 72% in cortical bone from mature sows to 44 to 46% in bones from young pigs (Crenshaw et al., 2013)**

- **However, the Ca (38-40%) and P (17-19%) content of bone remains constant (2.1:1.0) ratio.**
- **Bio-marker for bone: FGF23 , CYP27B1, CYP24A1, VEGF and MMP**
- **Over-supplementation of Ca and P dose not necessarily allow pigs to recover from skeletal integrity challenge.**

- **FGF23 is produced by osteoblast and osteocyte cells**
  - **It is regulated by vitamin D and blood P (Sitara et al., 2006; Crenshaw et al., 2011; and Lanske et al., 2014)**
  - **Reduce P reabsorption (kidney) and absorption (intestine)**
  - **Increase P excretion (kidney)**

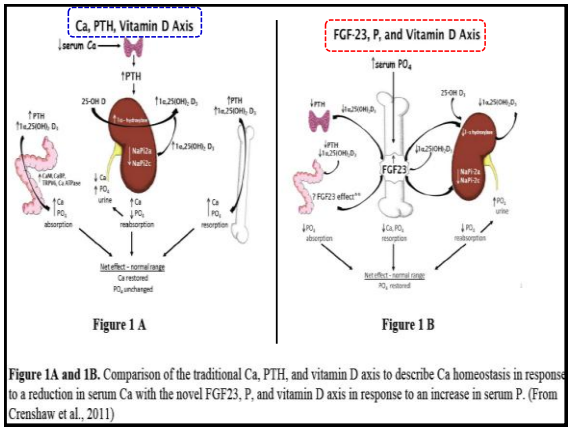


Figure 1A and 1B. Comparison of the traditional Ca, PTH, and vitamin D axis to describe Ca homeostasis in response to a reduction in serum Ca with the novel FGF23, P, and vitamin D axis in response to an increase in serum P. (From Crenshaw et al., 2011)

The results of probiotic….

- Even though no statistical differences were found between treatments (*p>0.05);* the supplementation of the gestation and lactation diets with the DFM improved the performance of the sows. (Castellanos et al., 2014)

The results of probiotic….

Table 1. Efficacy results obtained with *Bacillus subtilis CH27273* during 42 days from weaning

Treatment	ADG (g/day)	FCR (g feed /g gain)
Control	361 [a]	1.76 [b]
B.subtilis L	391 [b]	1.66 [a]
B.subtilis H	395 [b]	1.67 [a]

(a, b) Superscripts indicate statistically significant differences ($p \leq 0.05$) using a GLM procedure with initial body weight as covariate
L&H indicate the dosage 4 and 8 x10⁸ CFU/g, respectively Low and High dosage

Tabel 2. Daily visual score on fecal consistency per pen in efficacy trial with *Bacillus subtilis CH27273*

Treatment	Days with 2 and 3 score[1]	Sum of diarrhea days per pen	Diarrhea outbreak (days)
Control	3.9 [b]	9.5 [b]	3.2 [b]
B.subtilis L	1.2 [a]	2.4 [a]	1.3 [a]
B.subtilis H	1.1 [a]	2.3 [a]	1.2 [a]

[1]Faeces consistence per pen daily according to the scale (0-3 scale: 0-normal consistence; 1-soft; 2-diarrhoea/liquid; 3-serious diarrhea).
(a, b) Superscripts indicate statistically significant differences ($p \leq 0.05$) using a GLM procedure
L&H indicate the dosage 4 and 8 x10⁸ CFU/g, respectively Low and High dosage

Reduction in the diarrhea frequency and severity

Lund et al., 2014)

The results of probiotic….

Probiotic (*B. subtilis C-3102) is* beneficial in sows and piglets, especially when administered over the longer-term. (Kritas et al., 2014)

Table 1. Calsporin® efficacy in sows and litters

SOWS	1st cycle T1 n=27	1st cycle T2 n=28	2nd cycle T1 n=21	2nd cycle T2 n=23
Parity	3.3	3.6	4.2	4.2
Lactation (days)	30.1	29.7	26.7	27.1
Sow weight at study start (kg)	239	242	238	237
Backfat loss over lactation (mm)	3.9	3.4	3.8	2.7*
Sow weight loss over lactation (kg)	46.9	35.0*	40.1	25.2*
Sow feed intake during lactation (kg)	219	237*	220	230*
Wean-oestrus (days)	6.5	5.3*	6.8	6.0*
LITTER				
Nº piglets born	12.3	12.3	12.2	12.6
Weight of piglets at birth (kg)	1.6	1.5	1.4	1.5*
Nº pigs weaned	11.2	11.2	11.1	11.9*
Weight piglets at weaning (kg)	7.5	8.0*	7.7	8.1*
Piglet mortality (%)	8.4	6.3	9.1	5.7
Piglet diarrhoea score	5.2	4.6	6.4	4.2
Mean daily gain (g/piglet/day)	195	217*	236	244

*Figures in same row, within same cycle, differ significantly ($p<0.05$)

Acknowledgements

- Merial (Thailand) company
- Faculty of Veterinary Medicine, Kasetsart U.
- Thai Swine Veterinary Association (TSVA)