Effects of gestation housing systems on maternal stress, piglet maturity at birth and early survival

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Maternal stress and piglet neonatal survival

In intensive pig husbandry, sow housing and management system can generate maternal stress *(Merlot et al, 2013)*.

Maternal stress during gestation:
. has deleterious effects on maternal physiology or health *(Merlot et al, 2013)*
. might increase piglet neonatal mortality *(Tuchscherer et al, 2002)*

***Underlying hypothesis:* high concentrations of maternal cortisol during gestation may influence foetal development and maturation through modifications in nutrient partitioning and endocrine regulations in the foetuses**

➔thereby altering piglet neonatal survival

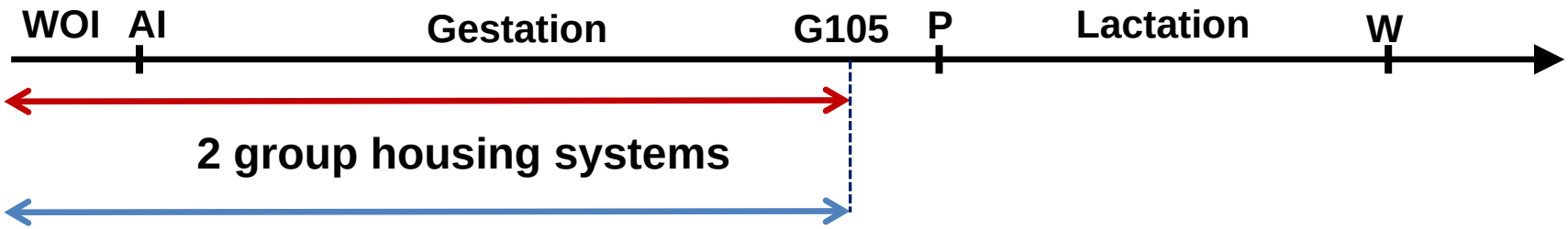
Objective

To compare 2 contrasted housing systems for gestating sows, one system being more stressful than the other one, by investigating

*** litter performance**

*** piglet maturity at birth and survival**

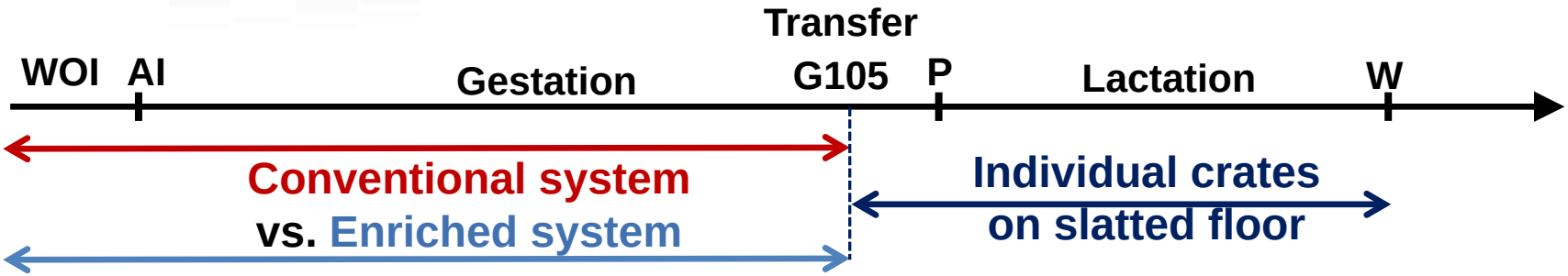
Experimental design

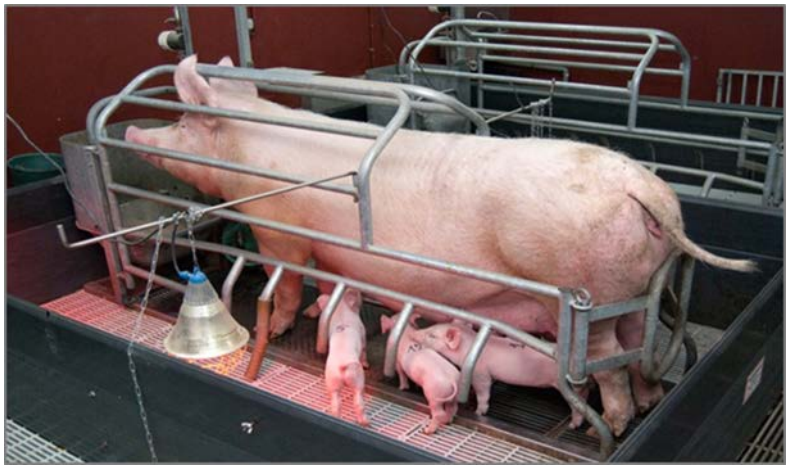


Conventional system
on slatted floor,
2.4 m²/sow

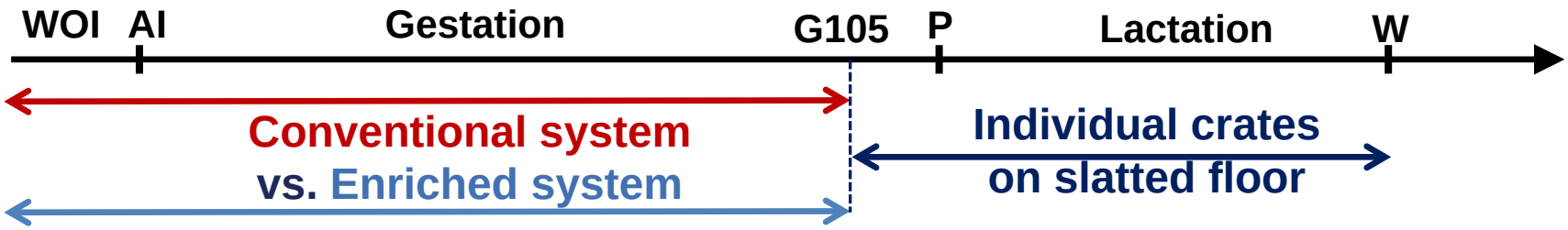
Enriched system
on straw bedding (deep litter),
3.5 m²/sow

Experimental design





Experimental design

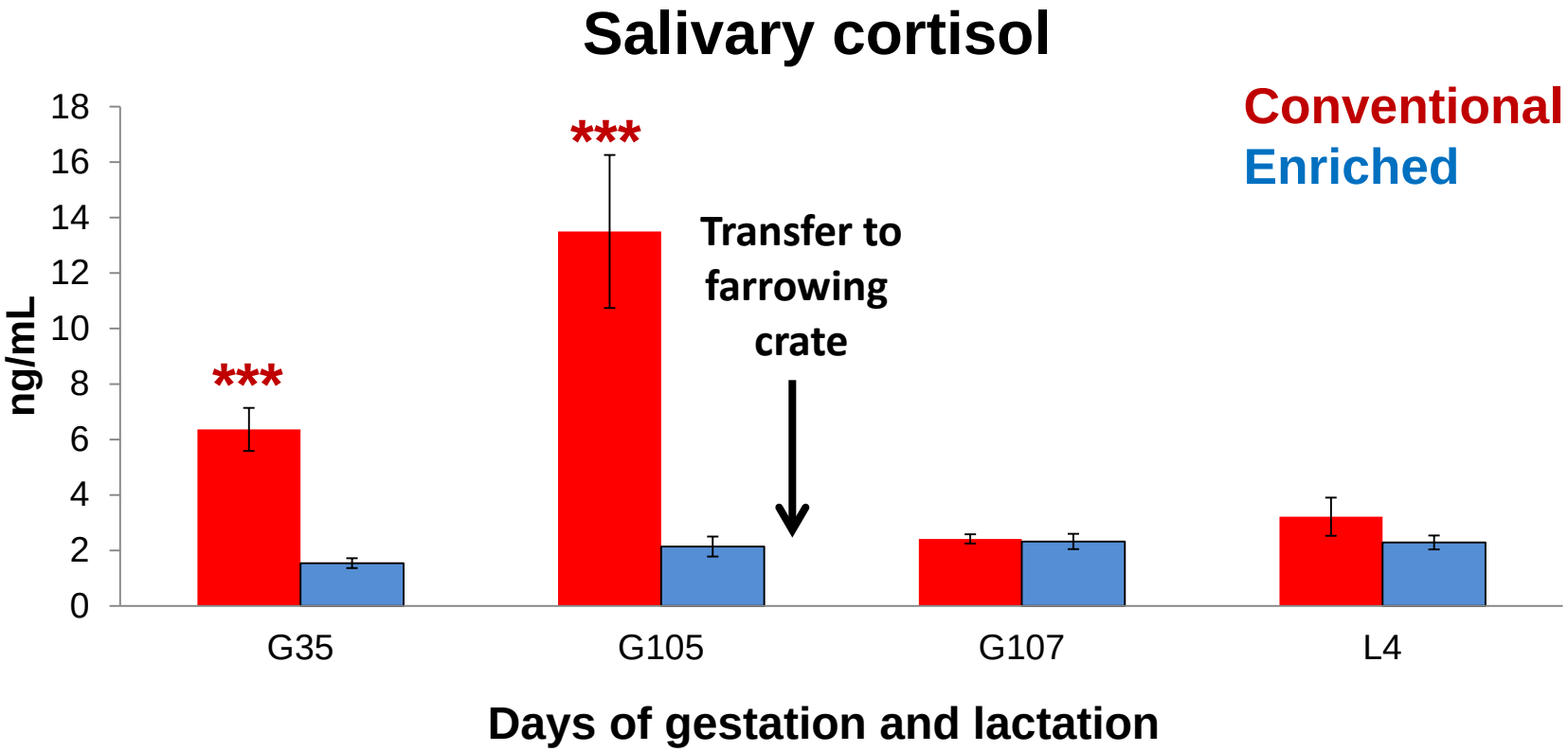


- **106 crossbred Landrace x Large White sows and their litter**

- Piglet mortality : all litters
- Maternal salivary cortisol : all sows

- **Mechanistic study** from birth to weaning : **n = 37 sows and their litter**
- Traits related to piglet physiology and maturity at birth
- Neonatal survival and early growth performance
- Nutritional composition of colostrum

Greater concentrations of maternal cortisol in the conventional system



Greater rate of piglet mortality in the conventional system

	System		Effect
	Conventional	Enriched	
No. of litters	49	57	
Mortality rates, %			
- At birth	8.6	6.5	0.07
- Early (12 h-72 h pp)	13.6	6.3	<0.001
- Late (72 h pp-weaning)	4.4	4.3	ns
- Overall	25.8	16.7	<0.001

Piglet characteristics at birth

18 C litters, 19 E litters

All piglets

	System		Effect
	C	E	
At birth			
- Body weight, kg	1.44	1.53	ns
- Length, cm	25	26	0.08
1 h after birth			
- Rectal temperature, °C	36.8	37.3	0.06

6 piglets/litter

	System		Effect
Plasma concentrations	C	E	
NEFA, µmol/L	19.7	19.9	ns
Lactate, mmol/L	5.2	5.7	ns
Albumine, g/L	8.7	8.5	ns
Fructose, mmol/L	2.6	3.2	ns
Glucose, mmol/L	2.9	3.2	0.10

Piglet maturity at birth

18 C litters, 19 E litters

1 male piglet/litter

		System		Effect
		C	E	
Organ weight	Body weight, kg	1.50	1.54	ns
	Heart, g	11.6	11.6	ns
	Liver, g	45.5	47.7	ns
	Kidneys, g	10.5	10.4	ns
	Gut, g	83.4	97.0	0.06
	in % BW	5.5	6.2	0.02

		C	E	
Energy reserves	Muscle glycogen, %	9.9	10.8	0.02
	Liver glycogen, %	12.9	13.2	ns

➔ ***Piglets from the conventional system were slightly less developed and had lower energy reserves.***

Other indicators of physiological maturity, including muscle and liver gene expression profiles, did not differ between C and E piglets.

No significant difference in piglet growth rate during the first 24 h

18 C litters, 19 E litters

	System		Effect
	C	E	
BW gain from birth to T24, g	82	114	ns

Nutritional composition of colostrum

	System		Effect
	C	E	
Dry matter, %	25.2	23.6	ns
Proteins, %	18.1	16.5	0.07
Lipids, %	5.0	4.4	ns
Lactose, %	2.5	2.6	ns
Gross Energy, kJ/g	6.1	5.6	ns

Conclusions

✓ **The conventional system was:**
- stressful for the sows during gestation,
- associated with increased neonatal mortality,
- not associated with a marked reduction in piglet maturity at birth.

✓ **It seems unlikely that only one trait altered by the system can be responsible for the large difference in neonatal survival;**
it is possible that the associations of differences in several traits have contributed to the difference in mortality.

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Thank you for your attention!