

## Early life predisposing factors for biting behaviours in pigs

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- Reasons to perform biting behaviours
- Influence of the pig's coping style & personality on biting behaviours
- Prenatal effects on biting behaviours
- Early postnatal effects on biting behaviours
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## General introduction

- ❑ Biting behaviours result:
  - ✓ directly in scratches, more or less severe lesions or even amputation of part of the body due to cannibalism
  - ✓ indirectly in injuries (e.g. lameness due to fighting), infections, immunosuppression, reduced growth
- ❑ Biting involves at least one performer and one receiver
- ❑ Biting usually induces avoidance by the receiver/victim
- ❑ 2 types of biting can be identified (*Simonsen, 1990*)
  - ✓ aggressive biting,
  - ✓ non-aggressive biting = oral manipulative biting



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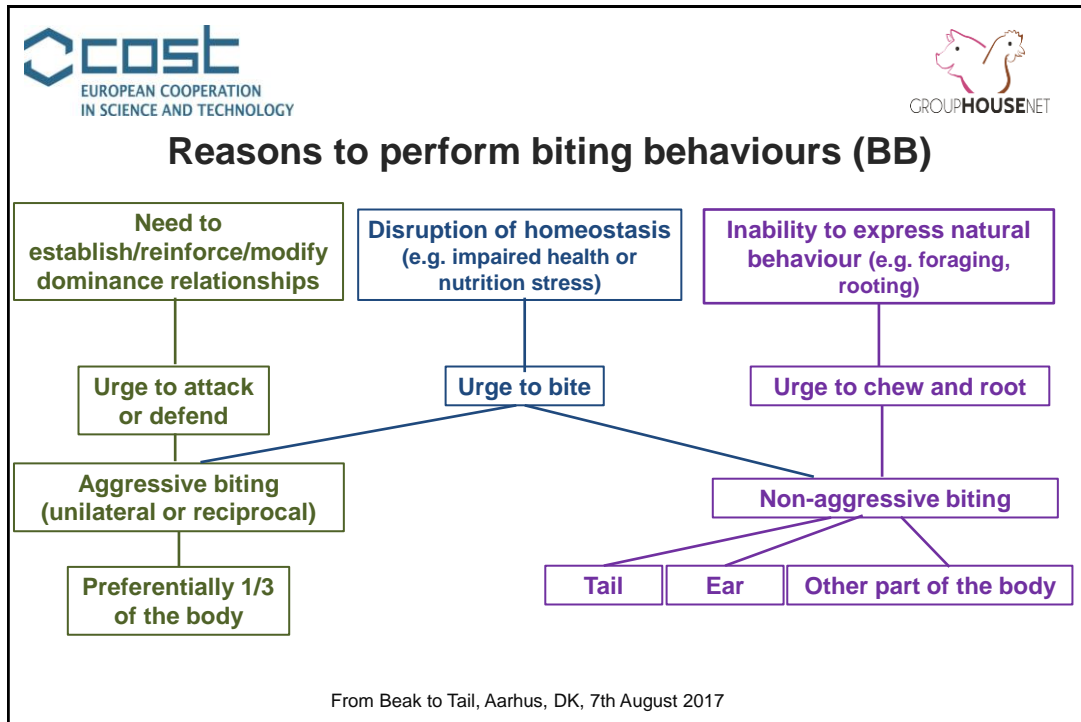
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## General introduction

- ❑ Aggressive biting:
  - ✓ Highly observed in the context of hierarchical formation
  - ✓ Can be observed in stable groups when pigs competing for resources or challenging the established order
  - ✓ Preferentially targeted at the front third of the body
- ❑ Non-aggressive biting:
  - ✓ Mainly unrelated to hierarchical formation
  - ✓ Occurs mainly in barren environments
  - ✓ Preferentially targeted at the tail
- ❑ Events affecting prenatal life or early postnatal life (from birth to weaning) can influence the predisposition to both types of biting behaviours
  - ✓ the propensity of pigs to perform but also to receive such behaviours
  - ✓ the way pigs react to these behaviours

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**Reasons to perform non-aggressive biting behaviours – alternative model**

- ❑ Three stages of non-aggressive behaviour with escalation from:
  - ✓ Pre-damaging (= non-damaging = gentle tail-in-mouth behaviour) to
  - ✓ Damaging (presence of bleeding lesions) to
  - ✓ Forceful/obsessive biting behaviour *Fraser & Broom, 1990*
- ❑ Non-aggressive biting = intensified variant of:
  - ✓ Suckling behaviour, it's a highly motivated behaviour maintained after weaning, which is generally abrupt in commercial piggeries
  - ✓ Exploratory behaviour for researching food, it's a highly motivated behaviour generally not satisfied in commercial piggeries, especially when pigs are kept on slatted floor

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## Influence of the pig's coping style or the personality on biting behaviours

### Background

High variability between pigs for performing or receiving biting. Could be explained, at least in part, by:

- ✓ Personality traits characterized by tests related to fearfulness, aggressiveness or reaction to novelty
- ✓ Coping style characterized by the backtest in piglets (attempts to escape when placed on the back: passive (= reactive = few attempts to escape) vs proactive (= numerous attempts to escape))



## Influence of the pig's coping style or the personality on biting behaviours

### Coping style and aggressive behaviour

- ✓ Proactive pigs perform more aggressive behaviours, *Boldhuis et al 2005*
- ✓ No difference in the coping styles but proactive pigs were more persistent in their aggression, *Melotti et al 2011*

### Coping style and non-aggressive behaviour

- ✓ In a barren environ, proactive pigs perform less oral behaviours directed to penmates *Boldhuis et al 2005*
- ✓ Proactive pigs perform less oral manipulative behaviours when the environment changed from enriched to barren, *Melotti et al 2011*

**What about personality traits ?**

## Prenatal effects on biting behaviours

### 1. Effects related to undernutrition of the foetuses

#### Background,

#### Aggressive behaviour

#### Non-aggressive behaviour

### 2. Influence of prenatal stress on biting behaviours

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### 3. Influence of hypoxia during the birth process

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### 4. Other effects

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### 1. Effects related to undernutrition of the foetuses

#### Background

- ✓ Potential causes of undernutrition: overcrowding of the uterus, undernutrition of the dam, maternal disease
- ✓ It will lower birth liveweight which itself is likely to influence postnatal growth
- ✓ May have direct influence on neuroendocrine systems (HPA, Poore & Fowden, 2003)

#### Aggressive behaviour

- ✓ Littersize at birth, body mass and crown-rump length at birth: no effect, *Drickamer et al 1999*

#### Non-aggressive behaviour

- ✓ Significant + genetic correlations between traits at birth and level of ear/tail biting, *Ursinus et al 2014*
- ✓ But no difference in birthweight between biting and non-biting pigs (*Ursinus et al 2014*) or between pigs performing high and low tail chewing after weaning (*Beattie et al 2005*)
- ✓ Hypothesis: the influence of birth weight may concern the propensity to be a victim

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## 2. Influence of prenatal stress on biting behaviours

### Background

- ✓ Prenatal stress = stress applied to the pregnant dam with effects on the foetuses
- ✓ Natural stressors: group mixing, rough handling, pain... HPA and sympathetic activation
- ✓ HPA activation can be mimicked by hydrocortisone, cortisol or ACTH treatments

### Aggressive behaviour

- ✓ No clear effects of cortisone (Kranendonk et al 2006), ACTH treatment or rough handling (Lay et al 2011)

### Non-aggressive behaviour

- ✓ Pigs born from social-stressed dams are more responsive to pain (*Rutherford et al 2009*, *Sandercock et al 2011*, *Rutherford et al 2009*) which may lower their propensity to be victims BUT
- ✓ Pigs born from ACTH treated dams healed slower after an injury (*Hausmann et al 2000*) which may increase their "attractiveness" to be bitten

## 3. Influence of hypoxia during the birth process

No information in the pig species  
See information in other species

## 4. Other effects

To be completed later on  
Input from the audience ?

....

## Early postnatal effects on biting behaviours

1. Effects related to undernutrition due to high litter size, low milk production
2. Effects related to social stress due to competition for teats or other resources
3. Effects related to cross fostering
4. Effects related to socialization of piglets by contacts with piglets from other litters
5. Effects related to a poor environment
6. Effects related to acute stress due to: handling, routine practices
7. Effects related to the age at weaning
8. Other effects

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### 1. Effects related to undernutrition

#### Background

- ✓ Potential causes of undernutrition: high litter size, poor health and agalactia of the dam, poor health of the individual
- ✓ It will lower growth, weight at weaning and thereafter

#### Aggressive behaviour

- ✓ Weight is an important determinant of the relative dominance order (*Beilharz & Cox 1967*) and difference in liveweight between pigs modifies the duration of an aggressive encounter (*Rushen 1987*) BUT
- ✓ In resident-intruder tests, weight of the pigs has no clear effect on aggressive behaviours (*Ehrhard & mendel 1997; D'eath & Pickup 2002*)

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## 1. Effects related to undernutrition due to high litter size, low milk production

### Non-aggressive behaviour

- ✓ Pigs performing more tail chewing behaviour had similar weight at birth but were lighter at weaning (*Beattie et al 2005*)
- ✓ “fanatical” tail-biting pigs did not differ in their birth or weaning weights but were lighter at the time of the tail biting episode (*van de Weerd et al 2005*)
- ✓ Tail-biter pigs were lighter at weaning (Zonderland et al 2011) BUT
- ✓ No difference of weight at weaning on damaging oral behaviour but biters were lighter later on (*Nieuwamerongen et al 2015*)

**Tail biting seems to be more related to a growth check shortly before the biting episode rather than to early undernutrition**

- ✓ Negative correlation between lesion score and weight at weaning suggesting that propensity to be bitten decreases with liveweight (*Staatveren et al 2016*)

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## 2. Effects related to social stress due to competition for teats or other resources

### Background

- ✓ High competition for a teat when litter size is higher than the number of functional teats
- ✓ Competition between pigs for the best “teats” (front teats for “moderate” litter size: *Scheel et al 1977*, middle teats for high litter size: *Skok & Gerken 2016*)
- ✓ Teat order established within the first days of life
- ✓ Competition between pigs for other resources like heat

### Aggressive behaviour

- ✓ Piglets from larger litters are more aggressive at weaning when regrouped (*D'Eath & Lawrence 2004*)
- ✓ Pigs from middle teats perform more aggressive interactions during lactation and after weaning (*Skok et al 2014*)

### Non-aggressive behaviour

- ✓ Literature not yet analysed

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### 3. Effects related to cross fostering

#### Background

- ✓ Cross fostering is needed with high prolific sows in order to “provide” teat to all piglets
- ✓ It is applied to new born (less than 2 days of age) or to 1-week piglets (two- step nurse sow system, *Baxter et al 2013*)
- ✓ Fostered piglets are more or less submitted to stress from social, nutritional and new environment origin which may have possible long term consequences on their behaviour and physiology

#### Aggressive behaviour

- ✓ Literature not fully analysed

#### Non-aggressive behaviour

- ✓ Literature not yet analysed

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### 4. Effects related to socialization of piglets by contacts with piglets from other litters

#### Background

- ✓ In commercial indoor piggeries, piglets are usually first mixed at weaning
- ✓ In wild boars or in outdoor conditions, piglets are socialized with others from ~1 week of age that leads to little aggression and few injurious bites (*Gunlach 1968*)
- ✓ Socialization in lactation may develop social skill and reduce biting behaviours later on

#### Aggressive behaviour

- ✓ Reduction in the frequency and/or duration of biting behaviour at post-weaning regrouping (*Wattanakul et al 1967, Weary et al 1999, D'Eath 2005....*)
- ✓ What about later on?

#### Non-aggressive behaviour

- ✓ Literature not yet analysed

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## 5. Effects related to a poor environment

### Background

- ✓ Enrichment with material to explore is already relevant for sucking piglets, at least from 10 days of age (*Lewis et al, 2006*)
- ✓ Olfactory enrichment may also be relevant (*Fuentes et al 2012*)
- ✓ A poor environment may induce chronic stress with possible long term consequences on behaviour and physiology
- ✓ The effect of enrichment with material to explore is often confounded with more space
- ✓ The influence of enrichment before weaning is confounded with disruption of enrichment, which itself may be of importance, when the later environment is poor

Treatment	Lactation	Later period
1	-	-
2	+	-
3	-	+
4	+	+

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## 5. Effects related to a poor environment

### Aggressive behaviour

- ✓ No clear effect of enrichment during lactation, possible effect is outweighed by the influence of enrichment during the postweaning or fattening periods (*van de Weerd et al 2005, Vanheukelom et al, 2011, Statam et al 2011*)
- ✓ Promising effects of olfactory enrichment during lactation (*Fuentes et al 2012*)

### Non-aggressive behaviour

- ✓ No clear effect of enrichment during lactation, possible effect is outweighed by the influence of enrichment during the postweaning or fattening periods (*van de Weerd et al 2005, Vanheukelom et al, 2011, Statam et al 2011*)

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### 6. Effects related to acute stress due to: handling, routine practices

Not yet evaluated, possible effects related to change in pain tolerance

### 7. Effects related to the age at weaning

Not yet evaluated

### 8. Other effects

To be completed later on  
Input from the audience ?

## General conclusion

### Regarding the elaboration of the manuscript:

any input (paper, suggestion...) is welcome (send to [armelle.prunier@inra.fr](mailto:armelle.prunier@inra.fr))

### Regarding the prenatal and early postnatal effects on biting behaviours :

- ✓ They do exist and are complex
- ✓ More “maturation” of the report is needed before providing a clear image
- ✓ Regarding non-aggressive biting, the influence of a given factor on the propensity to be a victim is not the “mirror” of its influence of the propensity to be a biter. In other words, when the probability to bite decreases, the probability to be bitten does not necessarily increases

**Thanks for your attention !**