Higher space allowance and straw rack as effective measures to reduce tail biting in fattening pigs

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Background

Critical animal welfare issue

Multifactorial origin

Tail docking widespread measure

Lack of space & manipulable material

Research question

Can tail biting behaviour and prevalence of tail lesions in fattening pigs be reduced by

- **increased space allowance** (1m² instead of 0.7m²/ pig) and
- provision of **straw in racks** as manipulable material?

Study design

- **3 commercial fattening farms** in Austria
- May 2013 - January 2014
- On each farm pigs in half of the pens were
  - offered more space and a straw rack (improved pens – **IP**)
  - remaining pens served as a control (control pens – **CP**)

Control pen & Improved pen

CP: 0.7m²/pig; wood/chain

IP: 1m²/pig, wood/chain & straw rack

Participating farms

	Farm 1	Farm 2	Farm 3	Total
Farm characteristics	• Fattening only • 1.400 fattening places (FP)	• Weaners + fatteners • 650 FP	• Breeding-finishing farm • 160 FP	
Manipulable Material	• Straw rack	• Straw rack	• Hay rack	
Pigs‘ tails	Tail docked	CP: tail docked IP: intact tails	Intact tails	
Pigs in study	**974** (556 CP, 418 IP)	**413** (246 CP, 167 IP)	**70** (42 CP, 28 IP)	**1,457** (844 CP,613 IP)

Animal welfare assessment I

- **Behavioural observation**:
  - Continuous, direct observation on farm (10 min/per pen)
  - **Tail biting behaviour**:
    Manipulating or chewing another pig's tail (BEATTIE ET AL., 2005) and taking the tail into the mouth (*tail-in-mouth-behaviour;* SCHRØDER-PETERSEN, ET AL. 2003)

Animal welfare assessment II

- **Tail lesion scoring scheme**

0 = no lesion

1 = very small lesion on tail tip

2 = first signs of infection

3 = severe injury, deeper tissue visible

Animal welfare assessment III

On-farm

2 observations:

Beginning (**I**)
Middle (**II**) } of fattening period

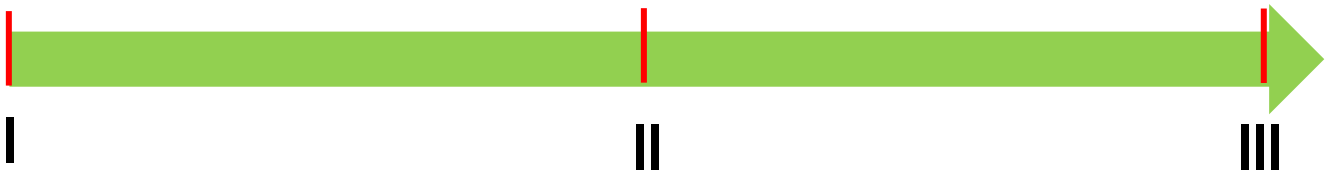
(TB behaviour & Tail lesions)

Abattoir

1 observation:

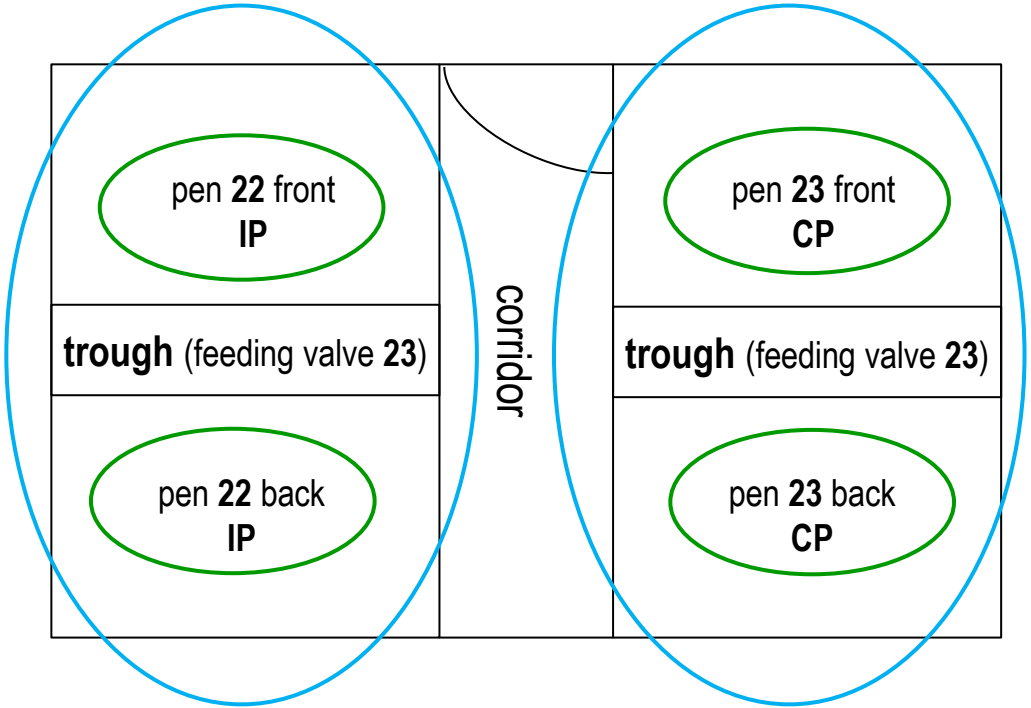
End (**III**) of fattening period

(Tail lesions; Production data)



Analysis

- Analysis of observations I & II: **pen level**
- Analysis of observations I, II & III: **feeding valve level**



- Analysis was performed for each farm individually

Results & Discussion I: *Tail biting behaviour*

- General linear model; fixed effects: treatment (T), observation (O), T*O
- Tail biting events/100 animals/10 minutes

Fixed effects	**Treatment CP vs. IP**		
Farm 1	CP: 5.7 ±9.6; IP: 2.8 ±4.8 **p=0.039**		
Farm 2	CP: 13.5 ±15.7; IP: 4.2 ±6.4 **p=0.005**		
Farm 3	n.s.		

Results & Discussion I: *Tail biting behaviour*

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Fixed effects	Treatment CP vs. IP	Observation I vs. II	
Farm 1	CP: 5.7 ±9.6; IP: 2.8 ±4.8 **p=0.039**	I: 0.7 ±2.3; II: 7.8 ±9.5 **p<0.001**	
Farm 2	CP: 13.5 ±15.7; IP: 4.2 ±6.4 **p=0.005**	I: 4.4 ±8.7; II: 14.1 ±14.9 **p=0.004**	
Farm 3	n.s.	n.s.	

Results & Discussion I: *Tail biting behaviour*

- General linear model; fixed effects: treatment (T), observation (O), T*O
- Tail biting events/100 animals/10 minutes

	CP vs. IP	Obs. I vs. II	Observation* Treatment
Farm 1	CP: 5.7 ±9.6; IP: 2.8 ±4.8 **p=0.039**	I: 0.7 ±2.3; II: 7.8 ±9.5 **p<0.001**	CP I: 0.6 ±2.0; CP II: 10.8 ±11.4 IP I: 0.8 ±2.6; IP II: 4.7 ±5.8 **p=0.028**
Farm 2	CP: 13.5 ±15.7; IP: 4.2 ±6.4 **p=0.005**	I: 4.4 ±8.7; II: 14.1 ±14.9 **p=0.004**	CP I: 5.7 ±10.9; CP II: 21.3 ±16.3 IP I: 3.0 ±5.7; IP II: 5.6 ±7.0 **p=0.040**
Farm 3	n.s.	n.s.	n.s.

Results & Discussion I: *Tail biting behaviour*

- Differences in line with other studies (e.g. BEATTIE ET AL., 2005; SCOTT ET AL., 2009)
- Farm 1 & 2 similar results although pigs in farm 2 had intact tails in IP

	CP vs. IP	Obs. I vs. II	Observation* Treatment
Farm 1	CP: 5.7 ±9.6; IP: 2.8 ±4.8 **p=0.039**	I: 0.7 ±2.3; II: 7.8 ±9.5 **p<0.001**	CP I: 0.6 ±2.0; CP II: 10.8 ±11.4 IP I: 0.8 ±2.6; IP II: 4.7 ±5.8 **p=0.028**
Farm 2	CP: 13.5 ±15.7; IP: 4.2 ±6.4 **p=0.005**	I: 4.4 ±8.7; II: 14.1 ±14.9 **p=0.004**	CP I: 5.7 ±10.9; CP II: 21.3 ±16.3 IP I: 3.0 ±5.7; IP II: 5.6 ±7.0 **p=0.040**
Farm 3	n.s.	n.s.	n.s.

Results & Discussion II: *Tail lesions*

- Non-parametric test (Mann-Whitney U-Test)

Tail lesions		Obs. I				Obs. II				Obs. III			
		CP		IP		CP		IP		CP		IP	
		Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n
Farm 1	Score 1	3.9%	19	5.4%	19	1.0%	19	3.4%	19	.	.	.	.
	Score 2	0.0%	19	0.0%	19	0.0%	19	0.6%	19	1.3%	16	1.3%	19
	Score 3	0.0%	19	0.0%	19	1.2%	19	0.0%	19	**1.7%***	16	**0.0%***	19

Obs. = Observation; Mean = mean percentage of pigs with lesions;
n = feeding valves;

Obs. III *p=0.023

Results & Discussion II: *Tail lesions*

- Lesions present already at beginning → weaners
- Measures more important towards end of fattening period?

Tail lesions		Obs. I				Obs. II				Obs. III			
		CP		IP		CP		IP		CP		IP	
		Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n
Farm 1	Score 1	3.9%	19	5.4%	19	1.0%	19	3.4%	19	.	.	.	.
	Score 2	0.0%	19	0.0%	19	0.0%	19	0.6%	19	1.3%	16	1.3%	19
	Score 3	0.0%	19	0.0%	19	1.2%	19	0.0%	19	**1.7%***	16	**0.0%***	19

Obs. = Observation; Mean = mean percentage of pigs with lesions;
n = feeding valves;

Obs. III *p=0.023

Results & Discussion IV: *Production data*

- Mixed linear model with batch as random effect;
  fixed effects: treatment, observation, T*O
- ADG: per feeding valve, Lean meat content: individual pigs

		CP			IP			p-value
		Mean	SD	n	Mean	SD	n	
Farm 1	ADG (g/d)	**816.9***	50.0	16	**900.5***	91.1	21	p=0.003
	Lean meat content (%)	60.4	6.2	348	60.7	2.7	306	
Farm 2	ADG (g/d)	725.5	63.6	12	750.3	58.3	12	
	Lean meat content (%)	60.6	2.1	215	60.7	2.1	155	
Farm 3	ADG (g/d)	712.8	68.8	6	757.8	42.8	6	
	Lean meat content (%)	**60.0***	1.9	49	**58.6***	3.3	31	p=0.012

Results & Discussion III: *Production data*

- **Higher ADG** in IP:
  - **significant difference** on farm 1: in line with other studies on the effects of higher space allowance and straw (ROSSI ET AL. 2008; STREET & GONYOU 2008; BEATTIE ET AL. 2000)
  - Reducing environmental stressors such as high stocking density might enable pigs to better achieve their growth potential (HYUN ET AL., 1998)
  - **no significant differences** on farms 2 and 3: Potential influence of other factors e.g. health status (milk spots, pneumonia)
- **No difference of lean meat content** on farms 1 & 2
  Farm 3: lower lean meat content in IP → in line with other studies (BEATTIE ET AL. 2000), but lower sample size

Conclusions & Implications

Higher space allowance and provision of a straw rack:

- **Tail biting behaviour reduced** but
- **Same prevalence of tail lesions**
  → behaviour as precursor for tail biting incidences (FRASER & BROOM, 1997, SCHRØDER-PETERSEN ET AL., 2003)
- **Omission of tail docking (farm 2)** did not increase the risk of tail biting behaviour and tail lesions.
- Measures reduce environmental stressors and might therefore lead to better **growth performance** while maintaining meat quality (% lean meat content).

Thanks to …

… farmers participating in the project

… BILLA for funding the project

… you for your attention!

Literature

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Farm details

	Farm 1	Farm 2	Farm 3	Total
Farm characteristics	• Fattening only • 1.400 fattening places (FP)	• Weaners + fatteners • 650 FP	• Breeding-finishing farm • 160 FP	
Manipulable Material	• straw rack • pigs had no experience	• straw rack • IP: straw for weaners	• hay rack • IP & CP: hay for weaners	
Pigs‘ tails	tail docked	CP: tail docked IP: intact tails	intact tails	
Batches	5	5	6	
Pens/Feeding valves	38 / 19	24 / 12	6 / 6	**68 / 37**
Pigs total	**974** (556 CP, 418 IP)	**413** (246 CP, 167 IP)	**70** (42 CP, 28 IP)	**1,457** (844 CP,613 IP)
Space allowance per pig (IP/CP)	1.03/ 0.76 m²	1.06/ 0.75 m²	1.11/ 0.71 m²	**1.04/ 0.75 m²**

Animal welfare assessment

- **Tail length**:
  - Categories: 0-5cm, 5-10cm, 10-15cm, 15-20cm, 20-25cm, >25cm
  - Each animal in a pen was assigned to a category
- ‘Assessment matrix’ for lesion score & tail length

Pen no.	5		**IP**	**CP**	II	30.06.
cm	0-5	>5-10	>10-15	>15-20	>20-25	>25
Score 0		7	2			
Score 1						
Score 2		1				
Score 3						

Results & Discussion II: *Tail lesions*

Tail lesions		Obs. I				Obs. II				Obs. III			
		CP		IP		CP		IP		CP		IP	
		Mean	n	Mean	n	Mean	n	Mean	n	Mean	n	Mean	n
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	Score 3	0.0%	19	0.0%	19	1.2%	19	0.0%	19	**1.7%***	16	**0.0%***	19
Farm 2	Score 1	3.1%	12	4.8%	12	3.8%	12	1.8%	12	.	.	.	.
	Score 2	0.6%	12	2.3%	12	0.0%	12	0.6%	12	0.4%	12	2.5%	12
	Score 3	0.0%	12	0.0%	12	0.0%	12	0.0%	12	0.0%	12	0.0%	12
Farm 3	Score 1	0.0%	6	16.7%	6	2.1%	6	0.0%	6	.	.	.	.
	Score 2	0.0%	6	2.8%	6	0.0%	6	0.0%	6	2.1%	6	6.7%	6
	Score 3	0.0%	6	0.0%	6	2.1%	6	0.0%	6	0.0%	6	10.0%	6

- Non-parametric test (Mann-Whitney U-Test)
- Obs. = Observation; Mean = mean percentage of pigs with lesions; n = feeding valves;

Obs. III *p=0.023