Pre-slaughter conditions influence skatole and androstenone in adipose tissue and blood of boars

Ina Jungbluth, Raffael Wesoly, Volker Stefanski, Ulrike Weiler

Institute of Animal Husbandry and Animal Breeding
Department of Behavioral Physiology of Farm Animals
UNIVERSITY of HOHENHEIM

MEAT INDUSTRY:

- Individual slaughter plants differ in the amount of tainted boar carcasses
- Reasons unknown

Aim of the study

Step 1:

Verify and quantify differences between slaughter plants in the amount of androstenone and skatole tainted carcasses

Step 2:

Identify relevant factors

Describe physiological mechanisms

Optimized treatment of boars pre-slaughter and during the slaughter process

Material & Methods: Experimental design

Animals:

- **207 boars randomly selected from 578 boars from 3 farms (A,B,C)**
- **2 genotypes (A = BW Hybrid; B, C = Danbreed x Duroc)**

Experimental conditions:

- **2 slaughter plants (I, II)**
- **Boars from each farm slaughtered at the 2 slaughter plants**
- **Differences in duration of transport and pre-unloading time**

Material & Methods: Duration of transport and pre-unloading time

Farm	Slaughter plant	Duration (min)	
		Transport	Pre-unloading
A	I	60	480
	II	240	202
B	I	150	165
	II	270	93
C	I	300	260
	II	90	17

Material & Methods: Sampling and Measurements

Samples:

blood (n=207)
adipose tissue (n=169)
urine (n=153)
faeces (n=124)

Measurements:

androstenone, ELISA (blood, liquid fat)
skatole, UPLC (blood, liquid fat)
testosterone, RIA (faeces, urine)
cortisol, RIA (faeces, urine)

Classification:

lesion score (0 - 3)
(**0** = none; **1** = 1-8; **2** = 9-24; **3** = >25 lesions per side)

Material & Methods: Statistics

ANOVA:

Model 1:

effect of farm, slaughter plant and farm x slaughter plant

Model 2:

additionally duration of transport and pre-unloading time as covariates

Pearson Correlations:

based on residual values

Results 1: Differences between slaughter plants in androstenone and skatole concentrations in fat

		Slaughter plant I n = 88		Slaughter plant II n = 81
Androstenone	LS-mean ± SEM	0.78 µg/g ± 0.07	*	1.00 µg/g ± 0.07
	> 0.5 µg/g	57.1 %		66.3 %
Skatole	LS-mean ± SEM	88.9 ng/g ± 6.8	* * *	59.6 ng/g ± 7.2
	> 150 ng/g	12.8 %		4.8 %

ANOVA: model 1 *** p< 0.05** ***** p< 0.001**

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ANOVA: model 1 * p< 0.05 *** p< 0.001

Results 2: Effects of transport and pre-unloading time on boar taint compounds in fat

	LS-mean ±SEM	Influence of slaughter plant	farm	transport	pre-unloading
Androstenone (µg/g fat) n=169	**0.89** ±0.05	**ns**	**ns**	*	**ns**
Skatole (ng/g fat) n=169	**73.8** ±4.97	**ns**	**ns**	**ns**	* *

ANOVA: model 2 **ns= not significant** * **p< 0.05** ** **p< 0.01**

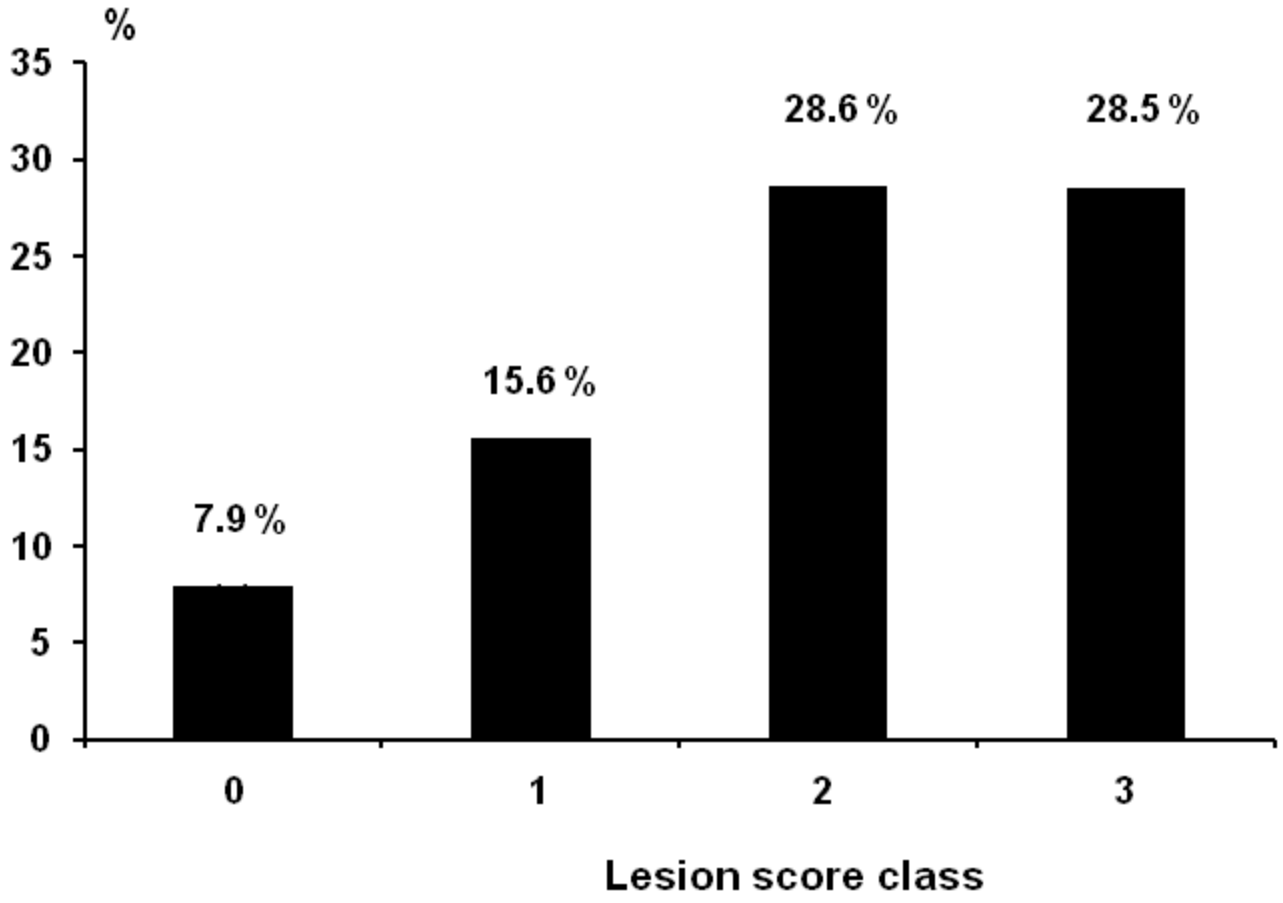
Results 3: Correlations between parameters

(based on residual values)

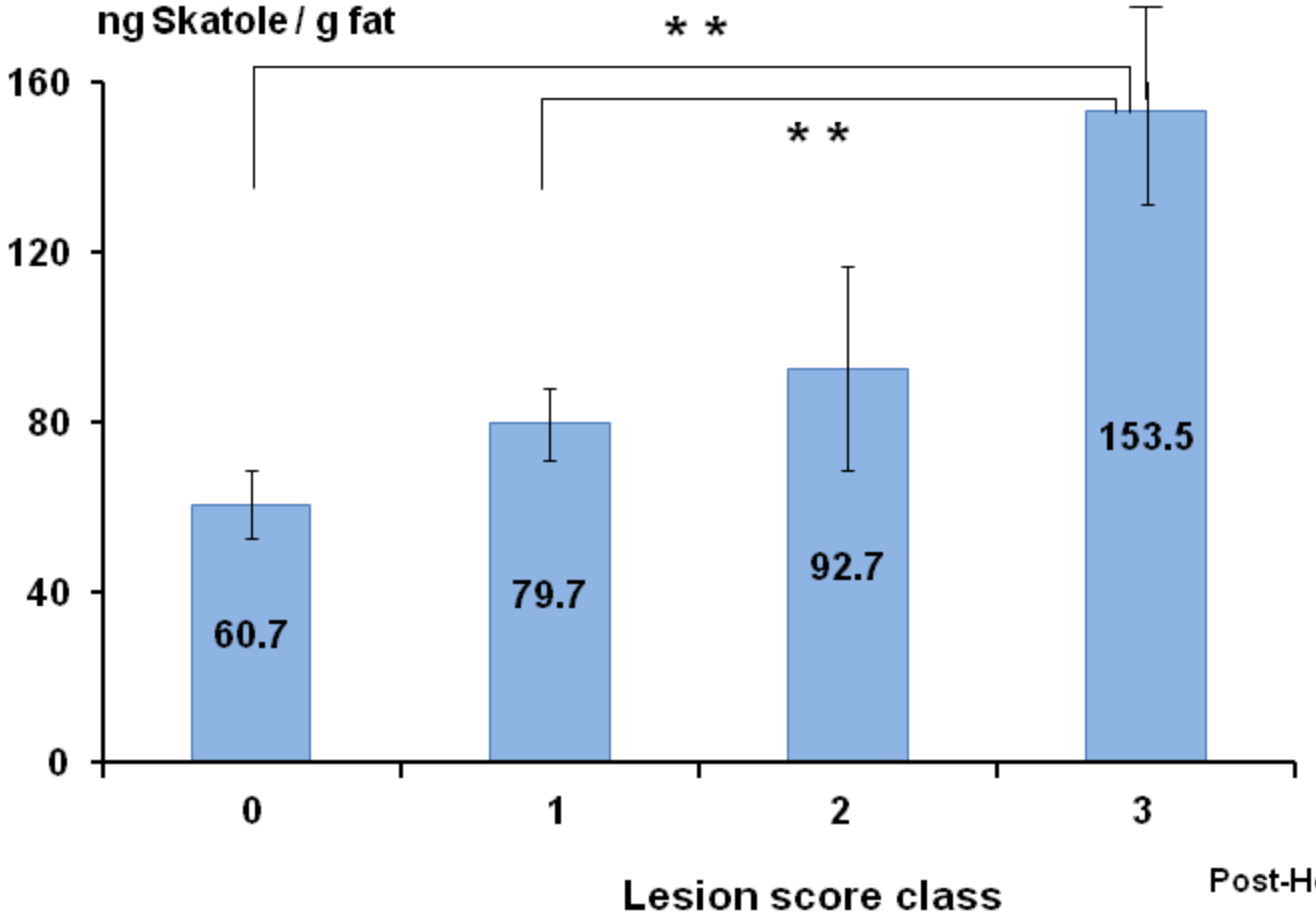
parameter	Androstenone (ng/ml plasma)	Skatole (ng/ml plasma)	Testosterone in urine (ng/mg creatinine)	Lesions Score (pts.)
Androstenone (µg/g fat)	**0.39*** ** n=168	**ns**	**0.32*** ** n=142	**ns**
Skatole (ng/g fat)	**ns**	**0.54*** ** n=168	**ns**	**0.23** ** n=150

ns= not significant ** p < 0.01 *** p < 0.001

Results 4: Relationship between lesion score and skatole tainted carcasses (% > 150 ng/g fat)



Results 4: Relationship between lesion score and skatole concentrations (LS-Means)



Post-Hoc: Tukey HSD; ** p< 0.01

Results 5: Estimated effects of covariates

(ANOVA: Model 2)

Increasing transport time results in:

Androstenone	**fat**	**+ 0.09 µg/h**	(LS-Mean: 0.89 µg/g)
Testosterone	**urine**	**+ 1.58 ng/h**	(LS-Mean: 10.1 ng/mg)
	faeces	**+ 1.39 ng/h**	(LS-Mean: 22.6 ng/g)
Cortisol	**faeces**	**+ 4.32 ng/h**	(LS-Mean: 49.7 ng/g)

Increasing pre-unloading time results in:

Skatole	**fat**	**+ 21.49 ng/h**	(LS-Mean: 73.8 ng/g)
Lesion score:		**+ 0.25 pts./h**	(LS-Mean: 0.68 pts.)

Conclusions

Androstenone concentrations are influenced by the duration of transport to the slaughter plant

➡ **increased testicular activity along transport**

Skatole concentrations increase with the pre-unloading time

➡ **increased aggressive interactions / higher lesion score**

To minimize the amount of tainted carcasses it is important to shorten both: the transport time and the pre-unloading time.

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