Behavioural response to an intermittent stressor is higher in entire compared to castrated male pigs

Mirjam Holinger
Barbara Früh, Peter Stoll, Robert Graage,
Michael Kreuzer, Armelle Prunier, Edna Hillmann
Background

- More skin lesions in entire compared to castrated male pigs (f.e.: Bünger et al., 2015; Holinger et al., 2015)
- More noise and disturbances (experience)
- → Chronic stress?
Research questions

- Is chronic stress level increased in entire male pigs?
Research questions

- Is chronic stress level increased in entire male pigs?
- Which reference indicators can be used to assess chronic stress?
Experimental design

2 x 2 x 2 design with
- Castration (entire / castrated)
- Chronic intermittent social stress CIS (with / without)
- Grass silage (with / without)

- Groups of 3 fattening pigs
- 6-7 repetitions per group
- in 4 runs
- Total of 147 pigs
Stress treatment

Chronic intermittent social stress treatment CIS:
- 10 x 30 min confrontations of 2 focal pigs
- 6 x 20 min separations
Data collection - behaviour

- Video observations
- 2 days each at beginning, mid and end of fattening period
- 9 x 10 min throughout the day
  - Lying, sitting, standing
  - Feeding behaviours
  - Agonistic behaviours
  - Manipulations of pen mates
  - Play behaviour
Data collection - stomach

0 = no change
1-4 = increasing hyperkeratosis
5 = Erosions
6 = Ulcer
Timeline

<table>
<thead>
<tr>
<th>Age in weeks</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Weaning</td>
</tr>
<tr>
<td>6</td>
<td>Grouping</td>
</tr>
<tr>
<td>10</td>
<td>5 x confrontations, video observations</td>
</tr>
<tr>
<td>16</td>
<td>5 x confrontations, 3 x separations, video observations</td>
</tr>
<tr>
<td>21</td>
<td>3 x separations, video observations</td>
</tr>
<tr>
<td>23</td>
<td>Slaughter</td>
</tr>
</tbody>
</table>

Ø
Data analysis

- (Generalized) linear mixed effect models with R including
  - Castration * stress * grass silage as fixed effects (plus period)
  - Nested random effects
- Parametric Bootstrap for $p$-values and model estimates
Results - behaviour

Castration n.s.
Stress $p = 0.07$
Castration*Stress n.s.
Results – behaviour

Castration $p < 0.01$

Stress $p = 0.04$

Castration*Stress n.s.
Results – behaviour

Castration n.s.
Stress n.s.
Castration*stress $p = 0.01$
Results – behaviour

Castration n.s.
Stress $p = 0.07$
Castration*Stress $p = 0.01$
Results – stomach

- Castration n.s.
- Stress $p < 0.01$
- Castration*Stress n.s
- Grass silage $p < 0.01$
Discussion & conclusions

- Stress treatment slightly reduced posture changes and agonistic behaviour → potential reference indicators
- Stress treatment increased gastric ulceration → gender-independent reference indicator

- No increased baseline level of chronic stress in entire male pigs

- But: CIS treatment caused higher behavioural stress response → implications for management & housing?
Further information

Chronic intermittent stress exposure and access to grass silage interact differently in their effect on behaviour, gastric health and stress physiology of entire or castrated male growing-finishing pigs

Mirjam Holingera, Barbara Frühab, Peter Stollc, Robert Grajed, Sandra Wirthd, Rupert Bruckmaiera, Armelle Pruinee, Michael Kreuzer, Edna Hillmann

*ETH Zurich, Institute of Agricultural Sciences, Universitätstrasse 2, 8092 Zurich, Switzerland
1Frib Research Institute of Organic Agriculture, Department of Extension, Training and Communication, Ackerstrasse 113, 5070 Frick, Switzerland
2Agroscope, Institute for Livestock Sciences I.L.S., Hofgasse 1, 1725 Postfach, Switzerland
3University of Zurich, Veterinary Faculty, Department of Farm Animals, Division of Small Medicine, Winterthurerstrasse 260, 8057 Zurich, Switzerland
4Swiss Sernova, Valais-Faculty, Veterinary Physiology, Bregagliastrasse 106a, 3903 Bex, Switzerland
5INRA, French National Institute for Agricultural Research, UMR 1346 PEGASE 4, clins 16, 38520 Saint-Gilles, France

Long-term effects of castration, chronic intermittent social stress, provision of grass silage and their interactions on performance and meat and adipose tissue properties in growing-finishing pigs

M. Holinger, B. Früh, P. Stoll, V. Pedan, M. Kreuzer, J. Bérand, E. Hillmann

*ETH Zurich, Institute of Agricultural Sciences, 8092 Zurich, Switzerland
1Frib Research Institute of Organic Agriculture, Department of Extension, Training and Communication, 5070 Frick, Switzerland
2Agroscope, Institute for Livestock Sciences, 1725 Postfach, Switzerland
3Zurich University of Applied Sciences, Life Sciences and Facility Management, 8920 Widnau, Switzerland
4ETH Zurich, AgroVet-Stickhof, 8315 Lindau, Switzerland
Thank you & thanks to all who supported this study!

Federal Food Safety and Veterinary Office
BLV
Discussion & conclusions

- Stress treatment slightly reduced posture changes and agonistic behaviour → potential reference indicators
- Stress treatment increased gastric ulceration → gender-independent reference indicator

- No increased baseline level of chronic stress in entire male pigs

- But: CIS treatment caused higher behavioural stress response → implications for management & housing?
Data collection – ACTH Challenge Test

- With approx. 18 weeks
- One focal pig per group
- Injection of Synacthen i.m.
- Collection of salivary samples every 20 min during 3 hours
Results - ACTH Challenge Test

**CIS**
- with
- without

Castration n.s.
Stress n.s.
Time * Stress $p = 0.06$
Time * Castration $p < 0.001$
Results - ACTH Challenge Test

Castration n.s.
Stress n.s.
Time * Stress $p = 0.06$
Time * Castration $p < 0.001$
Results - manipulations

Manipulation of pen mates [frequency/pig/90 min]

Entire males

Castrated males

Access to grass silage

CAS $P = 0.01$; SIL $P = 0.01$; CAS x SIL $P = 0.01$