EFFECT OF HEMP PRODUCTS ON GASTRIC ULCERS IN GROWING PIGS

29/8-2016, abstract 24058
BACKGROUND

› Approximately one third of the growers and half of the sows in Denmark have a ‘suboptimal’ gastric health
› This is a severe animal welfare problem, and an important economical challenge in the swine production
› How to reduce gastric ulcers without jeopardizing the feed efficiency?
Figure 8-1 Mucosal regions of the stomach of the pig. (Adapted from Sisson [1975] and Moran [1982]).
Low pH, high concentration of gastric acid, pepsin and bile acids

Pars esophagea is not protected by mucosa. Contact with the acid gastric content provokes gastric ulcer.

Importance of inflammatory reactions and oxidative stress reactions in the epithelium?
**Diagnostics - gastric score**

Score 6:
Ulcer in <10% of the white part or slight scar formation

0 1 2 3 4 5 6 7 8 9 10
**Effect of Disintegration Method on Stomach Score (Nielsen and Ingvarsen, 1999)**

<table>
<thead>
<tr>
<th>Disintegration Method</th>
<th>Fine Coarse</th>
<th>Fine Coarse</th>
<th>No. of Pigs (Barrows)</th>
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<tr>
<td>Normal (&quot;0&quot;)</td>
<td>1.3</td>
<td>72.4</td>
<td>67.7</td>
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<tr>
<td>Parakeratosis (&quot;1-3&quot;)</td>
<td>62.7</td>
<td>26.1</td>
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<td>Gastricle (&quot;4-6&quot;)</td>
<td>30.7</td>
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<td>Severe (&quot;7-10&quot;)</td>
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<td>1.5</td>
<td>1.5</td>
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<tr>
<td>Avr. Stomach Score</td>
<td>2.7</td>
<td>0.3</td>
<td>0.6</td>
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**Conclusion:** The disintegration method (ground or rolled) before pelleting is decisive for the development of gastricle lesions! But particle size influences the feed efficiency negatively.
AU-ANIS & SEGES: EFFECT OF STRAW ON GASTRIC ULCERS

N = 712 pigs

Red: ulcers without scarring
Blue: ulcers and/or scarring

Figure mod. from Jensen, K.H.
Conclusion: High content of straw has a positive effect on gastric health, and effects are similar as to those observed after feeding with coarse feed.
SUR MWF W#JHVHDF UF K # IP

3W#WKG | WH#HIFWR I# HWD | KHP S S URGXFW#RQ#
 S#UHVFQFH R# DWU# X#FWL H# JURZ HW

lqgxwhd#khp s=
0 Hdv| W#JURZ #KDQG#LQG#D#YW
0 GLHVDH S#HYHQW#QJ SRHQQ#DO
0 Qr#KF#HWD| GURFDQGDE#RQ
SUGGESTED MECHANISMS FOR HEMP?

› Hemp straw:
- More effective in absorbing liquid than other straw types
- Very strong
- Can increase consistency of stomach content and lead to less stomach lesions because of less acid and fluidity

› Hemp cake:
- Contains prebiotic fibres, bioactive substances and oil residues
- Tissue protecting properties
- The oil is used in human medicine as a therapeutic medical against inflammatory diseases.
JURZ HU#I [SHUIP HQW# Z IKP # HP S# SUR GX FWV

1. Grower experiment with hemp products 
   - To investigate if hemp products could prevent gastric ulcers in growers 
   - Design: Four groups (100 pigs in each, 30-110 kg) 
     - Diet 1: Meal 
     - Diet 2: Pellets 
     - Diet 3: Pellets (with 4% hemp cake before pelleting) 
     - Diet 4: Pellets (with 4% hemp husk after pelleting) 

2. Before slaughter: samples of saliva & feces 
3. After slaughter: clinical evaluation of stomach and sampling of content and epithelium.
AU-ANIS-GASTRIC ULCERS

CHARLOTTE LAURIDSEN

29.08.2016

Score 0-5 Score 6-7 Score 7-10

Meal Pellets Hempcake Hemphusk

Stomachscore of dietary treatments

\[ V_{wp} dfk \text{ vfruh} \# i\#hvdw \mid \text{ whdwp hqw} \]

\[ \text{Vrxufhv}\# \text{VVS}\# hggghdnhdn# 39< \]

\[ \text{DX Q} Q DQ \text{FVUJ D} \text{ VWUJF} \# \text{OQ HUV} \]
\[ \text{FKDUCR W} HHDQ \text{XULG VHQ} \]

\[ 5<B;6349 \]

\[ 46 \]
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<td>436</td>
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<td>(# wrp dfkv z lk# txhg wrp dfkv</td>
<td>&lt;=- 7;</td>
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<td>9: -</td>
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*Statistical significant from group 2*
Aarhus University Science and Technology

PhD defence paper

Title: Arachidonic acid cascade

Author: Charlotte Lauridsen

Date: 29.08.2016

Method: PLS-DA (partial least squares – discriminant analysis)

Graphs showing metabolomic profiles of saliva samples from healthy and ulcer patients.
OTHER (PRELIMINARY) RESULTS

Stomach content:
- less acetic acid, myristic acid, lactic acid, butyric acid...

and dry matter in 'Ulcer' pigs

Upregulation of inflammatory genes in epithelium of 'Ulcer' pigs

but no difference in faecal measurements (Prostaglandin and andcalpronetin)
**Ulcer healing**

Free arachidonic acid (ARA)

- **ROS**
  - Oxidation of epithelial cells

- **COX2**
  - Melatonin, (Bubenik et al, 1998)

**PGE2**

- Ulcer healing

Regulation of immune response (proinflammatory cytokines)
CONCLUSION AND PERSPECTIVE

- Hemphus, but not hemps cake, could reduce proportion of severe gastric ulcers
- Pigs with severe gastric ulcers and pigs with no gastric ulcers could be discriminated (metabolic profile of saliva)
- Continue studies on the pathogenesis in gastric ulcer development
- Feeding meal remains to be the best strategy to prevent the development of gastric ulcers in pigs
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BIOACTIVE FEED COMPONENTS

› Anti-bacterial: Susceptibility to gastric ulcers may be influenced by infectious diseases without implication of specific bacteria. Anti-bacterial components (e.g. alginate, fatty acids) may inhibit the pathogenesis.

› Anti-oxidative: Disturbance in mucosal balance between free radicals and antioxidants (e.g. vitamin E, selenium)

› Anti-inflammatory: substances that can blockade and reduce the inflammatory cascade (e.g. n-3 fatty acids)