The way to antibiotic free production

EUROPEAN PROTEIN

By Jens Legarth
Fermentation, nothing special in our own food...

The oldest and best way to preserve food
Advantages of fermenting feed

- Upgrading of raw materials
  - Increased digestibility of protein, phosphorous and fibres.
  - Breakdown of anti nutritional factors in leguminous plants.
  - More fibre uptake by young animals

- A lot of lactic acid present in the feed
  - Lower buffer capacity/pH in the stomach, natural barrier against pathogens
  - Improved gut and stomach health

- Production of natural enzymes during fermentation

- High numbers of LAB present in the feed
  - Improving gut health by colonizing in the hind gut and shifting micro floras

- Less need for medicines and antibiotics in production
Designer Protein - Extend the package of possibilities!

We need water/liquid in our process

It’s a simple and cheap process 100-150 €/ton processing costs

We can ferment any protein source

Not only one but a package of advantages will pay for the drying cost

Functional feed: Omega 3 and 6 fatty acids from mussels or seaweed

We can make mussels and seaweed farming into an industry!

Tomorrow’s solutions... today
Seaweed challenges for feed

• Strong cell walls! Equal to a low feed digestibility. Lactic acid/enzyme fermentation can destroy the cell walls.
• High sugar content! Poultry and small piglets cannot digest sugar. But lactic acid bacteria can convert sugar into lactic acid. Up to 10% lactic acid is obtained. Equal to 1.75 € per kg or 1.750 € per ton
• Contain 85% water! Screw press the seaweed and then preserve with lactic acid bacteria.
Materials containing seaweed have **MIC-values from 500µg/ml-32µg/ml for C. perfringens (quite good for an extract)**

- In comparison, the MIC values of EP100 and EP 200 are 5000µg /ml or higher
Designed proteins

• Why do we need the plant’s protein to mix with marine protein source?

• We see new substances connected to the mixture and the way we ferment
OD600 of E. coli ATCC 11229

Rape meal pH 5.5
Rape meal pH 6.5
EP100 pH 5.5
EP100 pH 6.5
EP109 pH 5.5
EP109 pH 6.5

delta OD600 (19hrs-0hrs)
Discovery of unique metabolites formed during the fermentation of especially rape and seaweed (perhaps associated with health effects)

- Dominant polyphenols (sinapic acid) from rape seed are converted to metabolite during fermentation. Metabolite is known from Kimchi and is present bioactive in EP100 and EP109

![Chemical structure of sinapic acid]

- EP 100 is rich in guanine / guanosine (DNA / RNA building blocks)
- EP 100 / EP 200 have sugars (possibly with phosphate) formed during fermentation
- EP109 has a very dominant and unique fatty acid which is interesting
Discovery of unique metabolites formed during the fermentation of especially rape and seaweed (perhaps associated with health effects)

- Glucosinolates (plant substances found in e.g. cabbage and rape seed) are degraded

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Acetate</th>
<th>Butyrate</th>
<th>Formate</th>
<th>Heptanoate</th>
<th>Hexanoate</th>
<th>Isobutyrate</th>
<th>Isovalerate</th>
<th>Lactate</th>
<th>Propionate</th>
<th>Succinate</th>
<th>Valerate</th>
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<tbody>
<tr>
<td>Control diet</td>
<td>130.26</td>
<td>52.89</td>
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<td>0.00</td>
<td>0.18</td>
<td>7.83</td>
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<td>1.62</td>
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<td>GSLs</td>
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<td>54.92</td>
<td>0.05</td>
<td>0.03</td>
<td>0.46</td>
<td>6.84</td>
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<td>KF147</td>
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<td>60.41</td>
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<td>0.06</td>
<td>0.35</td>
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<td>12.76</td>
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<td>KW30</td>
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<td>66.37</td>
<td>0.06</td>
<td>0.08</td>
<td>0.48</td>
<td>9.38</td>
<td>14.00</td>
<td>1.41</td>
<td>84.57</td>
<td>0.60</td>
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<tr>
<td>E. coli Nissle</td>
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<td>0.00</td>
<td>0.05</td>
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<td>7.16</td>
<td>10.33</td>
<td>92.13</td>
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<td>GSL+KF147</td>
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<td>74.61</td>
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<td>0.00</td>
<td>0.09</td>
<td>3.45</td>
<td>5.37</td>
<td>25.06</td>
<td>73.40</td>
<td>2.59</td>
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<tr>
<td>GSL+KW30</td>
<td>146.93</td>
<td>56.52</td>
<td>1.24</td>
<td>0.00</td>
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<td>3.03</td>
<td>4.49</td>
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<td>0.00</td>
<td>0.06</td>
<td>2.44</td>
<td>4.41</td>
<td>25.88</td>
<td>68.55</td>
<td>4.27</td>
<td>4.11</td>
</tr>
</tbody>
</table>

GLS + bacteria = 20 fold more lactate

Jane Mullaney 2013 (PhD thesis)
Relative abundance. 10 most prevalent bacterial genus for each respective feed and in each respective intestinal part (broilers)

**Ewers (ctrl)**
- **Duodenum**
  - Bacteroides
  - Enterococcus
  - Escherichia
  - Acinetobacter
  - Enterobacter

- **Jejunum**
  - Bacteroides
  - Enterococcus
  - Propionibacterium
  - Lactobacillus

**EP100**
- **Duodenum**
  - Enterococcus
  - Pseudomonas
  - Acinetobacter
  - Bacteroides
  - Bacteroides

- **Jejunum**
  - Bacteroides
  - Enterococcus
  - Lactobacillus
  - Lactobacillus
  - Acinetobacter
EWERS/EP100i relative abundance - genus

- Salmonella
- Mycoplasma
- Clostridium

Ewers/EP100i Lactobacillus - genus

- Lactobacillus
## Trial in Poland on gilts, University of Lublin

<table>
<thead>
<tr>
<th>Item</th>
<th>Control-gilts</th>
<th>EP100-gilts</th>
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</thead>
<tbody>
<tr>
<td>Piglets/total</td>
<td>16.25</td>
<td>15.75</td>
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<tr>
<td>Live born</td>
<td>14.25</td>
<td>14.42*</td>
</tr>
<tr>
<td>Weaning (28 d)</td>
<td>11.25</td>
<td>13.17*</td>
</tr>
<tr>
<td>BW at birth</td>
<td>1.12</td>
<td>1.17</td>
</tr>
<tr>
<td>BW at weaning</td>
<td>5.99</td>
<td>5.57</td>
</tr>
<tr>
<td>Litter BW - weaning</td>
<td>67.39</td>
<td>73.36*</td>
</tr>
</tbody>
</table>
How do we use our fermented proteins?

- Antibiotic free production proved in Pigs, Broilers, Layers and Turkey.
- We proved to reduce the antibiotic use to only 10% of the animals on pig farms. In poultry it is reduced to cero.
- In humans we can influence the micro flora in the gut to be more even.
ANTIBIOTIC FREE CONCEPT

FEEDING WITH DRY FERMENTED RAPE SEED AND SEAWEED ➔ AVOIDING PROBLEM ➔ NO PROBLEMS, NO ANTIBIOTICS
Tomorrow’s solutions... today