Congenital Articular Rigidity outbreak due to ruminal dysfunction in a Belgian blue cattle herd

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Congenital Articular Rigidity in BBCB

- Congenital arthrogryposis
- Limitation of the movements in utero
- Many aetiologies (virus, toxic, genetic,...)
- In BBCB: *In utero* hypomobility theory
  - I & Se deficiencies
  - Fetomaternal disproportion
    - 95 % = males
    - 81 % = posterior presentation
    - 15 % heavier

(Verschooten et al, 1969; Sartelet, 2007)
Treatments

- Digit flexor/carpal flexor tenotomy
- Splint or cast

(Verschooten et al, 1969; Sartelet, 2007)
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FARM DESCRIPTION

500 BBCB with 200 calvings/year
(Aug to Dec and Feb to June)

All AI or Embryo transfert

Housing: Free stalls and pastures

Feeding: 5 kg haylage, 12 kg maize silage,
10 kg pressed pulps, 1 kg concentrates 30 %,
100 g minerals & TE, 1 x/day, NO MIX
DATA INSPECTION

Aug. 2015 to Dec. 2015

120 calves born

- 17 CAR (10 surgically treated)
- 1 sudden death
- around 30% weak calves
- 2 generalized arthrogryposis

I & Se DEFICIENCIES?
LABORATORY INVESTIGATIONS

1) PCR BTV and SBV: NEGATIVE

2) BIOCHEMISTRY: pool of late prenancy cows
   - Vit. B12 = 145 ng/l (No: 187-883) => POOR RUMINAL FERMENTATION
   - Se = 75 µg/l (No: 80-110) => TRACE ELEMENTS DEFICIENCIES
   - Urea = 11 mg/dl (No < 15) => DIGESTIBLE PROTEINS DEFICIENCY
   - Cu = 75 µg/dl (No: 90-114)
   - NEFA = 0.54 mmol/l (No <0.30) => FAT MOBILIZATION
   - TP = 62-78 g/l (No: 57-81)
   - Glu = 42-62 mg/dl (No: 54-110) => ENERGY DEFICIENCY
MAIZE SILAGE

44 % of dry matter
low content of fibers = 17 % (Normal: 19-22)
26 % of starch.

Penn-State® separator
- upper sieve 2 % (No: 5 - 15 %)
- middle sieve 48 % (No: 45 - 65 %)
- lower sieve 50 % (No< 30 – 40 %)

maize silage was very dry
with a low content of fibers leading to
an increase of the by-pass starch level
Haylage #1:
- 50 % of DM
- low levels of proteins (11 %)
- high content of cellulose (31 %) with 57 % of NDF & 5 % of lignin
- low digestible sugars (2 %)
- low rate of digestibility (58 %)

Haylage #2:
- 36 % of DM
- 18 % of proteins
- 21 % of cellulose
- Digestibility is good with a rate of 71 %

#1 too fibrous and not enough digestible for the rumen
• Bunk score around 2
• 2 kg of haylage out of the 5 kg
• 3 kg of maize silage out of the 12 kg
• The rumination score is low for the farmer
• Water flow = 2l/min (No: 10)

12 cows last month of pregnancy:
• Body condition score: 4/5 BUT slimming at the end
• Rumen fill score: 5/5 with a hard content
• Faeces digestibility score: around 3 and 4 /5
• Mixed faeces (around 1 kg) analysis:
  • high content of 33 % (No < 30) of fibers & grains
  • lot of undigested maize grains (> 5 grains)
  • long fibers particles (> 1.25 cm).
Ruminal fluid collection on 7 cows

Geishauser probe "Elevator"
Ruminal pH (No: 6.5)
  • 5 cows = 7.3
  • 2 cows = 6.5

Methylene blue reduction test:
  • 5 cows > 6 min. (higher pH)
  • 2 cows around 5 min

Microscopic evaluation:
  • 5 cows = low content of the different size (L, M & S) of protozoans with an absence of activity for the 5 cows with higher pH and
  • 2 cows = poor protozoan activity
Ruminal function influenced by diet parameters in dairy herds with milk fat drop syndrome (MFDS) in Belgium

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INTRODUCTION

MFDS is usually attributed to herds with acidosis risks and/or maize based diet associated to shift in the rumen. It could also happen when the rumen fails to produce enough acetic acid.

In Belgium, the MFDS is also present even in grass based diets and if fibers reach largely international standards.

The objectives of this study is to compare ruminal functions with diet quality and risks of MFDS.

RESULTS: 30.5 kg milk/d 188 DIM
- Average fat in milk: 3.6 ± 0.58
- Average pH: 6.5 ± 0.53
- Mean cellulose: 184.7 ± 21.9 g/kg of dry matter (DM)
- Average NDF: 394.9 ± 35.6 g/kg DM and starch was 177.7 ± 44.5 g/kg DM.

LOW RISK ON LACK OF FIBERS

NO CORRELATION BETWEEN pH and FAT (Fig. 4)

Farm with MFDS:
- only 4.7% of acidosis BUT 21% of alkalosis
- 14.1% of slow ruminal functions was found

CONCLUSION

Links with MFDS are complex so adding bicarbonate has to be thoughtful.
Measurement of the ruminal pH only couldn't provide enough information on diagnose and treatment of ruminal problems.
To look at the management of the farm, diet, body condition score and all the ruminal activity parameters are needed to apprehended the MFDS.

MATERIALS AND METHODS

233 cows from 50-200 days in milk in 38 dairy farms with MFDS. Samples were collected on each cow and analyzed on site:
- Health scores (1 to 5 scale)
- Rumen juice with an oral probe (Flora®) (Fig.1):
  - measurements of pH.
  - redox evaluation by methylene blue test (Fig. 2).
  - observation of protozoa (Fig. 3).
- Individual diet was evaluated and milk parameters were provided by milk control or robot.

RESULTS

- Significant linear correlations between the pH in the rumen and cellulose (r=0.36, P<0.001)
- The other significant correlations were quadratic (P<0.001).

The better model explaining (50.8%) the pH variation is:

\[ \text{pH} = \text{NDF, sugars, proteins and bypass starch} \]

<table>
<thead>
<tr>
<th></th>
<th>OR</th>
<th>P&lt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alkalosis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slow ruminal function</td>
<td>1.8</td>
<td>0.03</td>
</tr>
<tr>
<td>(redox &gt; 4 min)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>By-pass starch &gt; 1.2 kg/d</td>
<td>6.2</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Slow ruminal function</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cellulose &gt; 190 g/kg DM</td>
<td>2.9</td>
<td>0.02</td>
</tr>
<tr>
<td>Cellulose &gt; 190 g/kg DM and sugars &lt; 5% of DM</td>
<td>3.5</td>
<td>0.02</td>
</tr>
</tbody>
</table>
SYNTHESIS

- Trace elements deficiencies

- Ruminal dysfunction and impaction
  - very poor quality of the forages
  - the distribution of the ration promoting sorting
  - the insufficient water access

- The poor quality of the maize silage
  - lot of indigestible fibers
  - by-pass starch encourage glucose absorption in the intestine and then fattening of the cows.

RECOMMENDATIONS

- Add 1 kg of wheat/day/cow to add starch in the ration.
- Injectable and oral micronutrients supplementation was recommended for the next calvings.
- A vertical diet feeder to avoid sorting and was accepted by the farmers.
- For the next pasture season, a micronutrients supplementation was recommended
CONCLUSION

IN UTERO HYPOMOBILITY THEORY
- 1st described evidence
- Lack of abdominal space = impaction + fat
- Ruminal dysfunction
  - decreases micronutrients absorption despite the sufficient intake
  - protein-energy malnutrition

MONITORING OF INGESTED AND METABOLIZED FOOD TOOLS FOR MONITORING TRACE ELEMENTS DEFICIENCIES
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