Menini F.X., Gohier C., Bourdillon A., Leroy G.

EFFECT OF THE MONOPROPYLENE GLYCOL ADDITION IN DRINKING WATER AT DIFFERENT PERIODS DURING MATERNITY PERIOD ON THE PERFORMANCE OF RABBIT DOES AND KITS

Full text of the communication +
Slides of the oral presentation

How to cite this paper
EFFECT OF THE MONOPROPYLENE GLYCOL ADDITION IN DRINKING WATER AT DIFFERENT PERIODS DURING MATERNITY PERIOD ON THE PERFORMANCE OF RABBIT DOES AND KITS

Menini F.X.1*, Gohier C.1, Bourdillon A.1, Leroy G.2

1MiXscience, Rabbit Nutrition Department, 2 avenue de Ker Lann, 35170 Bruz, France
2Sanders Ouest, Le Pont d’Etrelles, 35370 Etrelles, France
*Corresponding author: francois-xavier.menini@mixscience.eu

ABSTRACT

Monopropylene glycol (MPG), a complementary feed and precursor of glucose for the treatment and prevention of subclinical acetonemia in cattle, has been tested in a rabbit farm by addition in drinking water at different times during parturition period. Three groups of does received 0,4% of MPG in water either during four days before birth B (B-4 days to B, BB group), or double distribution (B-4 to B) and around the lactation peak (B+14d to B+18d, LP group), or without MPG (C group). Mortalities of does and kits were unaffected by the addition of MPG. However, the addition of MPG only before parturition had a positive effect on growths and weights of rabbits from 21 to 25 days old.

Key words: Propylene glycol, Propane-1,2-diol, Pre-parturition, Pre-weaning, Nutritional water product.

INTRODUCTION

During the first three weeks of gestation, does increase their feed consumption to support the fetal growth. During this period, energy balance is positive (Gidenne, 2015) and body reserves increase. Does which are concurrently pregnant and lactating need higher digestible requirements (Partridge et al., 1986). At this period, despite a higher consumption, they are frequently in deficit energy balance generally linked to a fertility reduction (Fortun-Lamothe, 2006), a dysregulation of the immune system, and a lower prolificacy performance (Parigi-Bini et Xiccatto, 1993). Therefore, it is necessary to support energy intake of does during this period, especially at the peak of lactation (around 17 days after birth).

Monopropylene glycol (MPG), is a widely used product with diverse applications in animal production. This raw material is colorless, odorless, no corrosive, slightly tasting sugar and water soluble. It is used, as a glucose precursor, for dairy cows at the beginning of lactation to limit the decrease of body weight (Liu et al., 2009). After ingestion, it is absorbed by rumen (Fournet, 2012), or converted in glucose or partially metabolized to propionic acid (C3) via ruminal bacterial fermentations (Studer et al., 1993) reducing ketosis. Rabbits, according analogies with ruminants and monogastrics (Philippe, 1981), can store and metabolize glucose. Provided MPG can be metabolized by the rabbit and no metabolized overage is eliminated in urine (INRS, 2010).

There is no scientific rabbit publication on the period of MPG administration. Some breeders are using MPG around does parturition, others around the lactation peak. Both methods can be technically justified. The aim of this study is to evaluate zootechnical effects of MPG distributed in maternity, according to one or two distributions, and determine the best period to use this product.
MATERIALS AND METHODS

Animals and experimental design
On a commercial farm, 125 multiparous does (≥ 3 parturitions, Hyplus PS19; Hypharm, France) were divided in 3 groups according to distribution of MPG in drinking water. A total of 41 does received water including 0.4% (4ml/L) of MPG during 4 days before birth (BB); 44 does received the same doses of MPG added to water during 4 days before birth and for 4 days (birth +14 days to birth+18 days) around lactation peak (LP) and other 40 does, as a control group, received water without MPG (C). Water and commercial feed were distributed *ad libitum*. Three days (d3) after parturition, litter size was standardized to 10 kits. At d9, litters were homogenized according to kits weight.

Measurements
All does were weighted at d4; d9 and d31 (1 day before weaning d32). Size and weight of litters were controlled at d9, d14, d21, d25 and d31. Mortality was followed on these same dates. Daily temperatures inside the building were recorded. The global water consumption was registered daily for the entire room (656 does) and was specifically registered for the groups which received MPG (during the product distribution period).

Statistical Analysis
Statistical analysis was realized with software R version 3.5.0. Growing performances (live weight and average daily gain) were analysed with initial weight as a covariate. Mortalities and pregnancy diagnosis were studied using chi square test.

RESULTS AND DISCUSSION

The experiment was carried out during summer (June and July 2018) with sometimes high outside temperatures. Temperatures recorded in the building varied from 15.9 to 28.2°C with an average of 21.8°C.

Effect on water consumption during MPG distribution
The global water consumption of does and litters, during maternity period, was quite low (average 1.25 L/d vs 1.55 L/d usually in this farm during all the year). Moreover, during MPG distribution, BB and LP does groups consumed less water than the entire room (Figure 1, average -41% BB group and -32% LP group). Water consumption was lowest the first day of MPG distribution (-65% BB and -74% LP). Comparatively, the animals increased their water consumption the second day.

![Figure 1: Consumption of water during pregnancy distribution](image)

Effect on does and kits mortalities
Does mortalities were unaffected by distribution of MPG (Table 1). Despite a decrease of litter mortality in the 2 groups receiving MPG, the differences in mortality of young rabbits were not significant.
Table 1: Effect of propylene glycol on mortalities in maternity from 9 to 31 days after birth

<table>
<thead>
<tr>
<th></th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbits mortalities</td>
<td>2.5%</td>
<td>1.22%</td>
<td>1.14%</td>
<td>NS</td>
</tr>
<tr>
<td>Does mortalities</td>
<td>5.88%</td>
<td>6.82%</td>
<td>5.45%</td>
<td>NS</td>
</tr>
</tbody>
</table>

Effect on litters growth and weight performances

Results are shown in Table 2. MPG had a significant effect on rabbit weight at 31 days (1 day before weaning). Individual rabbit weights of LP group were lower than the BB and C groups (P<0.05), -27.9 g and -32 g, respectively. There was no difference regarding rabbit weights between BB and C groups. These weight differences were already observed at 25 days in favor of BB group (+44.1 g vs C group and +65.7 g vs LP group).

Growth was different between 21 to 25d (P<0.01) with a sudden increase of growth of BB group (47 g/d vs 34.4 g/d for C group and 32 g/d for LP group). Then C group and LP group had to some extent a compensatory growth during the next period (25 to 31 days). These results showed a potential effect of MPG on energetic metabolism of does when it is distributed around birth. MPG could allow better lactation and therefore better rabbit viability and growth after lactation peak.

The significantly lower average weight of young rabbits observed in LP group at 31 days could be due to the double distribution of MPG and a possible toxic effect after double does consumption. Indeed, according above description, rabbits’ weight was not different before 21 days and differences appeared after the 2nd distribution of MPG (d14 to d17), while rabbits start drinking water usually from 20 days (probably an after effect on rabbits). According low water consumption of LP group, another hypothesis could be that a double distribution of MPG increased an inappetence effect, decreasing water consumption of does and consequently its milk production and which may have affected results. This possible toxic effect has never been demonstrated in the scientist literature. Only few studies focused essentially on a distribution of MPG 4 to 5 days before insemination but not before birth and at lactation peak. The toxic effects have been demonstrated in fattening rabbits with significantly higher doses (18 mg / kg per os; 6 mg / kg intramuscular and 8 mg / kg intravenous) (Ruddick, 1972) and lower growth above 4.2 mg/kg/d of MPG (Braun et al., 1936).

Table 2: Effect of propylene glycol on litters weight and growth

<table>
<thead>
<tr>
<th></th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbits, no.</td>
<td>400</td>
<td>410</td>
<td>440</td>
<td>NS</td>
</tr>
<tr>
<td>Live weight 9 d (g)</td>
<td>197</td>
<td>191</td>
<td>190</td>
<td>NS</td>
</tr>
<tr>
<td>Live weight 14 d (g)</td>
<td>265</td>
<td>260</td>
<td>258</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Live weight 21 d (g)</td>
<td>366</td>
<td>360</td>
<td>354</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Live weight 25 d (g)</td>
<td>503&lt;sup&gt;b&lt;/sup&gt;</td>
<td>547&lt;sup&gt;b&lt;/sup&gt;</td>
<td>482&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Live weight 31 d (g)</td>
<td>740&lt;sup&gt;a&lt;/sup&gt;</td>
<td>735&lt;sup&gt;a&lt;/sup&gt;</td>
<td>708&lt;sup&gt;a&lt;/sup&gt;</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Weight gain 9 -14 d (g/d)</td>
<td>13.6</td>
<td>13.7</td>
<td>13.5</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Weight gain 14 -21 d (g/d)</td>
<td>14.4</td>
<td>14.3</td>
<td>13.7</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Weight gain 21 -25 d (g/d)</td>
<td>34.4&lt;sup&gt;b&lt;/sup&gt;</td>
<td>47.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>32.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Weight gain 25 -31 d (g/d)</td>
<td>39.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>31.3&lt;sup&gt;b&lt;/sup&gt;</td>
<td>37.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>NS</td>
</tr>
<tr>
<td>Weight gain 9 -31 d (g/d)</td>
<td>24.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>24.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>23.5&lt;sup&gt;b&lt;/sup&gt;</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Means with different letters on the same row differ significantly (P=0.05). P0: initial weight as a covariate

Effect on weight and pregnancy diagnosis of does

We recorded a higher decrease of individual does weight in LP Group between 9 to 31 days after birth (-146g vs -75g C group and -76g BB group). We did not make the same observations as Luzi et al. (2000) who concluded on the improvement of does weight at weaning. But it must be underlined that they had administered the product at different dose and period (2% of MPG 5 days before AI) as an alternative synchronizing method.
On pregnancy diagnosis (d23), the BB group obtained the best rate of females estimated pregnant (79% vs 69.7% C group and 69.3% LP group). But these differences were not significant (P=0.34). This is in agreement with results of Luzi et al. (1999) and Luzi et al. (2000) with respectively +11% fertility rate and +20% of positive results at the following pregnancy diagnosis.

CONCLUSIONS

During summer conditions with high temperatures, MPG positive effect on does weight has not been proven. A distribution of MPG to a doe before parturition had positive effects on fertility diagnosis and on young rabbit weights at 21 days.

It is not advised to distribute MPG a second time during the peak lactation period. Additional experiments could verify the effect of different MPG dosages and the direct positive impact of this product on the quantity of milk produced by the does.

ACKNOWLEDGEMENTS

The author thanks the farmer, the trainee Alizé Philouze, the technical advisor Guillaume Leroy and the provider of the product TECNOFIRM for their contributions to this study.

REFERENCES


Ruddick J.C., 1972. Toxicology, metabolism, and biochemistry of 1,2-propanediol. Toxicology and Applied Pharmacology, 21, 102-111.

EFFECT OF THE MONOPROPYLENE GLYCOL ADDITION IN DRINKING WATER AT DIFFERENT PERIODS DURING MATERNITY PERIOD ON THE PERFORMANCE OF DOES AND RABBITS

Menini F.X., Gohier C., Bourdillon A., Leroy G.
Context: Deficit energy balance in maternity

Dairy Cows

- **Negative Energy Balance** (especially after 2\textsuperscript{nd} parity, at the start and peak lactation, different factors, generally high production level)

- **Impact on:**
  - Ketosis (metabolic disease)
  - \(\rightarrow\) body condition
  - \(\rightarrow\) milk Production

MONOPROPYLENE GLYCOL (MPG) is added as a **precursor of Glucose**
Context: Deficit energy balance in maternity

Dairy Cows

- **Negative Energy Balance** (especially after 2nd parity, at the start and peak lactation, different factors, generally high production level)

- **Impact on**:
  - Ketosis (metabolic disease)
  - ↓ body condition
  - ↓ milk Production

Does

- **Negative Energy balance** during lactation despite an increase of feed intake, especially at peak of lactation, during last week of gestation, and for young does (Gidenne, 2015)

- **Impact on does & Kits**:
  - ↓ Total born
  - ↓ Live born
  - ↓ Fertility
  - Dysregulation of immunity

MONOPROPYLENE GLYCOL (MPG) is added as a precursor of Glucose
Context: Monopropylene glycol (MPG) effects

- **MPG** \((C_3H_8O_2)\)
  - Colorless, odorless, no corrosive
  - Slightly tasting sugar
  - Water soluble

![Diagram of the Krebs Cycle involving MPG](image)

1. MPG (2%) 4 days before IA in drinking water
2. Flushing effect of MPG against PMSG & control
3. +11% Fertility but higher nest mortality (+7%)

- Weight of does (Luzi & al, 1999)
  - MPG (2%) 5 days before IA in drinking water
  - No difference on nest mortality or fertility
  - +109g/roe (weight at weaning)

- Weight of Rabbits (Braun H. & al, 1936)
  - 2.1 mg/kg/d => +1.07 kg/fattened rabbit
  - Vs 3.15 mg/kg/d => +0.64 kg/fattened rabbit
  - Low dose, better ADG
Context: Monopropylene glycol (MPG) effects

MPG (C₃H₈O₂)
- Colorless, odorless, no corrosive
- Slightly tasting sugar
- Water soluble

Fertility (Luzi & al, 1999)
- MPG (2%) 4 days before IA in drinking water
- Flushing effect of MPG against PMSG & control
- +11% Fertility but higher nest mortality (+7%)

Weight of does (Luzi & al, 2000)
- MPG (2%) 5 days before IA in drinking water
- No difference on nest mortality or fertility
- +109g/doe (weight at weaning)

Weight of Rabbits (Braun H. & al, 1936)
- 2,1 mg/kg/d => +1,07 kg/fattened rabbit
- Vs 3,15 mg/kg/d => +0,64 kg/fattened rabbit
- Low dose, better ADG
Materials and Methods

- A commercial farm in Brittany-France, during summer
- Genetic = Hyplus PS 19 x Hyplus PS 59
- 125 Multiparous does ≥ 3 parturitions
- Distribution of MPG at 0.4% in drinking water (4ml/L) with specific distribution per group. Water and feed Ad libitum.

Recorded:
- Individual weight of doe
- Size, weight of litter
- Water consumption maternity unit (656 does) & each group during MPG distribution

Diagram:

```
WEANING (32d)  B-4d  Birth (B)  B+14d  B+18d  WEANING (32d)
C    group 40 does
BB   group 41 does
LP   group 44 does
        MPG        No MPG        MPG        No MPG        MPG        No MPG
```

12th World Rabbit Congress
Results and Discussion: water consumption

• Consumption of water (all maternity unit) d-5 to d+32 = 1.25 < 1.55 l/day/doe+litter

Consumption of water during distribution of propylene glycol (L/day/does+litter)

- BB -41%
- LP -43%
# Results and Discussion: mortalities and growth

<table>
<thead>
<tr>
<th></th>
<th>COMMERCIAL FARM TRIAL</th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbits, numbers</td>
<td>Rabbits, numbers</td>
<td>400</td>
<td>410</td>
<td>440</td>
<td>P0 Group</td>
</tr>
<tr>
<td>Mortality of Rabbits (9 to 31 days)</td>
<td>2.5 %</td>
<td>1.22 %</td>
<td>1.14 %</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Mortality of Does (9 to 31 days)</td>
<td>5.88 %</td>
<td>6.82 %</td>
<td>5.45 %</td>
<td>NS</td>
<td></td>
</tr>
</tbody>
</table>
## Results and Discussion: mortalities and growth

### COMMERCIAL FARM TRIAL

<table>
<thead>
<tr>
<th>Rabbits, numbers</th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C group</td>
<td>400</td>
<td>410</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>P0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live weight 9 d (g)</td>
<td>197</td>
<td>191</td>
<td>190</td>
<td>NS</td>
</tr>
<tr>
<td>Live weight 14 d (g)</td>
<td>265</td>
<td>260</td>
<td>258</td>
<td>&lt;0.01 NS</td>
</tr>
<tr>
<td>Live weight 21 d (g)</td>
<td>366</td>
<td>360</td>
<td>354</td>
<td>&lt;0.01 NS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Gain 9 -14 d (g/d)</td>
<td>13.6</td>
<td>13.7</td>
<td>13.5</td>
<td>&lt;0.01 NS</td>
</tr>
<tr>
<td>Average Daily Gain 14 -21 d (g/d)</td>
<td>14.4</td>
<td>14.3</td>
<td>13.7</td>
<td>&lt;0.05 NS</td>
</tr>
</tbody>
</table>
### Results and Discussion: mortalities and growth

<table>
<thead>
<tr>
<th></th>
<th>COMMERCIAL FARM TRIAL</th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbits, numbers</td>
<td></td>
<td>400</td>
<td>410</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td><strong>Mortality of Rabbits</strong></td>
<td>(9 to 31 days)</td>
<td>2.5 %</td>
<td>1.22 %</td>
<td>1.14 %</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Mortality of Does</strong></td>
<td>(9 to 31 days)</td>
<td>5.88 %</td>
<td>6.82 %</td>
<td>5.45 %</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Live weight 9 d (g)</strong></td>
<td></td>
<td>197</td>
<td>191</td>
<td>190</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Live weight 14 d (g)</strong></td>
<td></td>
<td>265</td>
<td>260</td>
<td>258</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Live weight 21 d (g)</strong></td>
<td></td>
<td>366</td>
<td>360</td>
<td>354</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Live weight 25 d (g)</strong></td>
<td></td>
<td>503b</td>
<td>547a</td>
<td>482b</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Live weight 31 d (g)</strong></td>
<td></td>
<td>740a</td>
<td>735a</td>
<td>708b</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td><strong>Weight gain 9-14 d (g/d)</strong></td>
<td></td>
<td>13.6</td>
<td>13.7</td>
<td>13.5</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td><strong>Weight gain 14-21 d (g/d)</strong></td>
<td></td>
<td>14.4</td>
<td>14.3</td>
<td>13.7</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td><strong>Average Daily Gain 21-25 d (g/d)</strong></td>
<td></td>
<td>34.4b</td>
<td>47.0a</td>
<td>32.0b</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td><strong>Average Daily Gain 25-31 d (g/d)</strong></td>
<td></td>
<td>39.4a</td>
<td>31.3b</td>
<td>37.6a</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Average Daily Gain 9-31 d (g/d)</strong></td>
<td></td>
<td>24.7a</td>
<td>24.7a</td>
<td>23.5b</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>
### Results and Discussion: mortalities and growth

<table>
<thead>
<tr>
<th>Rabbits, numbers</th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbits, numbers</td>
<td>400</td>
<td>410</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td><strong>Mortality of Rabbits (9 to 31 days)</strong></td>
<td>2.5%</td>
<td>1.22%</td>
<td>1.14%</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Mortality of Does (9 to 31 days)</strong></td>
<td>5.88%</td>
<td>6.82%</td>
<td>5.45%</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Live weight 9d (g)</strong></td>
<td>197</td>
<td>191</td>
<td>190</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Live weight 14d (g)</strong></td>
<td>265</td>
<td>260</td>
<td>258</td>
<td>&lt;0.01 NS</td>
</tr>
<tr>
<td><strong>Live weight 21d (g)</strong></td>
<td>366</td>
<td>360</td>
<td>354</td>
<td>&lt;0.01 &lt;0.01</td>
</tr>
<tr>
<td><strong>Live weight 25d (g)</strong></td>
<td>503b</td>
<td>547a</td>
<td>482b</td>
<td>&lt;0.01 &lt;0.01</td>
</tr>
<tr>
<td><strong>Live weight 31d (g)</strong></td>
<td>740a</td>
<td>735a</td>
<td>708b</td>
<td>&lt;0.01 &lt;0.05</td>
</tr>
<tr>
<td><strong>Weight gain 9-14 d (g/d)</strong></td>
<td>13.6</td>
<td>13.7</td>
<td>13.5</td>
<td>&lt;0.01 NS</td>
</tr>
<tr>
<td><strong>Weight gain 14-21 d (g/d)</strong></td>
<td>14.4</td>
<td>14.3</td>
<td>13.7</td>
<td>&lt;0.05 NS</td>
</tr>
<tr>
<td><strong>Average Daily Gain 21-25 d (g/d)</strong></td>
<td>34.4b</td>
<td>47.0a</td>
<td>32.0b</td>
<td>&lt;0.05 &lt;0.01</td>
</tr>
<tr>
<td><strong>Average Daily Gain 25-31 d (g/d)</strong></td>
<td>39.4a</td>
<td>31.3b</td>
<td>37.6a</td>
<td>NS &lt;0.01</td>
</tr>
<tr>
<td><strong>Average Daily Gain 9-31 d (g/d)</strong></td>
<td>24.7a</td>
<td>24.7a</td>
<td>23.5b</td>
<td>&lt;0.01 &lt;0.05</td>
</tr>
</tbody>
</table>

- Difference observed at 25 days in favor of BB Group (+44g) due to a sudden increase of growth (21-25d) → MPG before birth → effect on does energetic metabolism, lactation and growth after peak of lactation?
Results and Discussion: mortalities and growth

<table>
<thead>
<tr>
<th>COMMERCIAL FARM TRIAL</th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbits, numbers</td>
<td>400</td>
<td>410</td>
<td>440</td>
<td>P0 Group</td>
</tr>
</tbody>
</table>

- Live weight 25 d (g) | 503b | 547a | 482b | <0.01 | <0.01 |
- Live weight 31 d (g) | 740a | 735a | 708b | <0.01 | <0.05 |
- Weight gain 9-14 d (g/d) | 13.6 | 13.7 | 13.5 | <0.01 | NS |
- Weight gain 14-21 d (g/d) | 14.4 | 14.3 | 13.7 | <0.05 | NS |
- Average Daily Gain 21-25 d (g/d) | 34.4b | 47.0a | 32.0b | <0.05 | <0.01 |
- Average Daily Gain 25-31 d (g/d) | 39.4a | 31.3b | 37.6a | NS | <0.01 |
- Average Daily Gain 9-31 d (g/d) | 24.7a | 24.7a | 23.5b | <0.01 | <0.05 |

- Difference observed at 25 days in favor of BB Group (+44g) due to a sudden increase of growth (21-25d) → MPG before birth → effect on does energetic metabolism, lactation and growth after peak of lactation?
- LP Group (double distribution) = lower weight and growth at 31 days (-32g & -1.2 g/d), After 2nd distribution → 1/Too much consumption? Or 2/Inappetence effect/low water consumption/ ∆ lactation?
Results and Discussion: weight of does and fertility diagnosis

- **Group:** P = 0.63
  - **P0:** <0.01
  - **Group:** NS

**Days after birth**

- **Weight of Does (g)**
  - **C group:** -75 g
  - **BB group:** -76 g
  - **LP group:** -146 g

- **LP Group**
  - (double MPG distribution):
  - Higher decrease of does’ weight

- **C group** vs. **BB group** vs. **LP group**
  - **P**-Value

**Fertility diagnosis (d 23)**

- **C group:** 69.7 %
- **BB group:** 79 %
- **LP group:** 69.3 %

**NS**

- **Difference** / **C group**
  - +9.3%
  - -0.4%

- **BB Group**:

- **Too much consumption/ Inappetence effect**
- **low water consumption**
- **feed consumption ?**
Results and Discussion: weight of does and fertility diagnosis

<table>
<thead>
<tr>
<th>Days after birth</th>
<th>C group</th>
<th>BB group</th>
<th>LP group</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Following Fertility diagnosis (d23)</td>
<td>69.7 %</td>
<td>79 %</td>
<td>69.3 %</td>
<td>NS</td>
</tr>
<tr>
<td>Difference / C group</td>
<td>+9.3 %</td>
<td>-0.4 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **LP Group** (double MPG distribution): higher decrease of does’ weight ≠ Luzi & al (2000) (MPG Al-5d)
  - Too much consumption/Inappetence effect
  - low water consumption
  - feed consumption?

- **BB Group**: higher Fertility diagnosis (NS) = Luzi & al (1999) (+11% fertility)

Group : P=0.63

P0 : <0.01

Group : NS

P0 : <0.01

Group : NS

Days after birth

Weight of Does (g)

- C group -75 g
- BB group -76 g
- LP group -146 g

Following Fertility diagnosis (d23)

- 69.7 %
- 79 %
- 69.3 %
- NS

Difference / C group

- +9.3 %
- -0.4 %
Conclusion

• During summer condition and in water distribution:
  
  MPG positive effect on weight of does has not proven

  Distribution of MPG before parturition:
  Has no effect on viability of Rabbits and Does before weaning
  Has a positive effects on weight of rabbits at 21 days old
  Has shown a better Fertility diagnosis (but Not Significant)

  it is not recommended to have two MPG distributions before parturition and at peak of lactation

• Perspectives:

  Effect of MPG dosage? In Dairy Cows (Liu Q & al, 2009) has shown linear effect on evolution of body weight

  Effect of MPG on primiparous?
  on quantity of production of milk?
  on fertility at farrowing?
  according to the seasons?

  Effect of association of (MPG+ Vitamins + plant extract) like:

VOLINERGY Product
Thank for your attention!

François X Menini
Francois-xavier.menini@mixscience.eu
http://www.mixscience.eu