Istituto di Zootecnica
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Session 18 Abstract 2711

Effects of Polinacea™ extract in periparturient dairy cows

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INTRODUCTION

Periparturient dairy cows (sick or clinically healthy) are characterized by:

- ⬇ immune system activity (Kehrly, 1997)
- inflammatory-like conditions:
  - ⬆ of positive acute phase plasma proteins (+APP; e.g. haptoglobin)
  - ⬇ of negative acute phase plasma proteins (-APP; e.g. albumin, lipoproteins, Retinol Binding Protein)

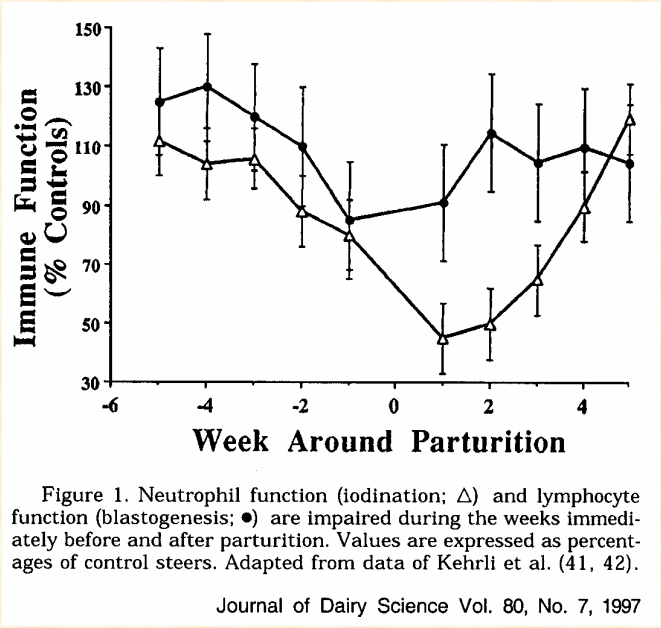

Figure 1. Neutrophil function (iodination; △) and lymphocyte function (blastogenesis; ●) are impaired during the weeks immediately before and after parturition. Values are expressed as percentages of control steers. Adapted from data of Kehrli et al. (41, 42).

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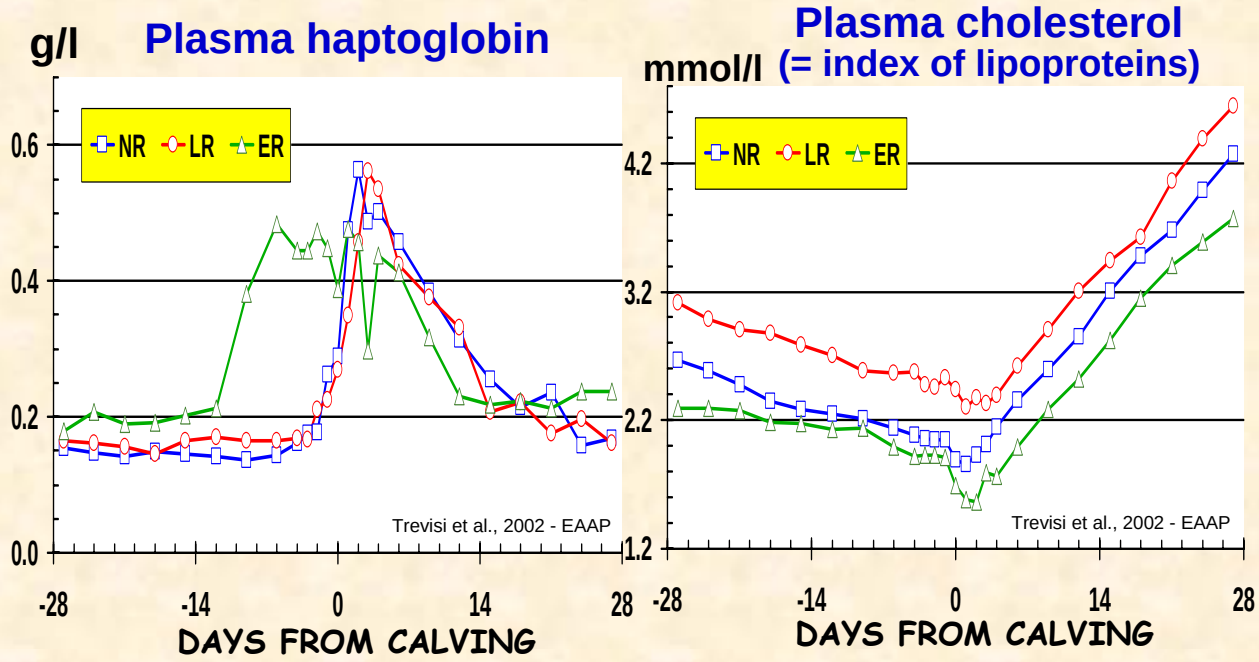


- The reduction of immune activity also starts before calving and has been related to an increase of infectious diseases (i.e. mastitis)
- The inflammatory conditions:
  - ✓ begin some days before calving or immediately after
  - ✓ could be explained by several factors (infections, parasites, stress, trauma, etc.) and promote the release of pro-inflammatory cytokines
  - ✓ the severity of inflammation is related to the worsening of performance (Bertoni et al., 2008) and to the rising risk of fatty liver (Bertoni et al., 2004)
- Therefore, both the rise of immune activity around calving & the attenuation of inflammation seem useful for the success of transition period, as confirmed by our results (Trevisi et al. 2003; Trevisi et al., 2008), obtained administering antinflammatories around calving or some day after it

- Nevertheless, alternative ways to the drug approach are needed. With this in mind, the use of some phyto-extracts seems particularly promising;
- In fact, several plants have demonstrated therapeutic properties on human and on farm animals, but the knowledge - particularly on dairy cows - is inadequate
- Interestingly, some of these extracts (e.g. *Echinacea angustifolia)* has showed:
  - ✓ immunomodulatory effects
  - ✓ antinflammatory effects

  (Morazzoni et al., 2005)

AIM

To investigate the administration of standardized Echinacea angustifolia extract around calving in dairy cows as a possible control strategy of periparturient immune and inflammatory response

MATERIALS & METHODS

- **Experimental barn (cows kept tied):**
  - ✓ **Dry off: about 8 wk before expected calving**
  - ✓ **Feeding plan: 2 forage meals (every 12 h) & 2 (dry period) or 8 (lactating) concentrate meals; water ad libitum**
  - ✓ **Milking: 2 per day**
- **ANIMALS – 8 multiparous Friesian dairy cows allocated in 2 homogeneous groups (BCS, milk yield, day of calving):**
  - ✓ **POL: 4 cows received 2 mg/kg/d of Polinacea™ extract (Indena s.r.l., Milan, Italy) from *Echinacea angustifolia* per os, in the last 30 days of pregnancy and first 14 days in milk**
  - ✓ **CTR: 4 cows without any dietary supplement, used as control**

CHECKS

- **Rectal temperature, feed intake, milk yield & health status: daily**
- **Body condition score (BCS): weekly**
- **Body weight: every 2 weeks and the day after calving**
- **Uterus involution (horns & cervix diameters) and ovary size: weekly (after calving) by transrectal ultrasonography**
- **Milk composition (fat, protein, lactose, SCC): 2 times per week**
- **Blood samples (from the jugular vein before feeding):**
  - ✓**2 times a week routinely**
  - ✓**daily, 10 days before and after calving**

BLOOD ASSAYS

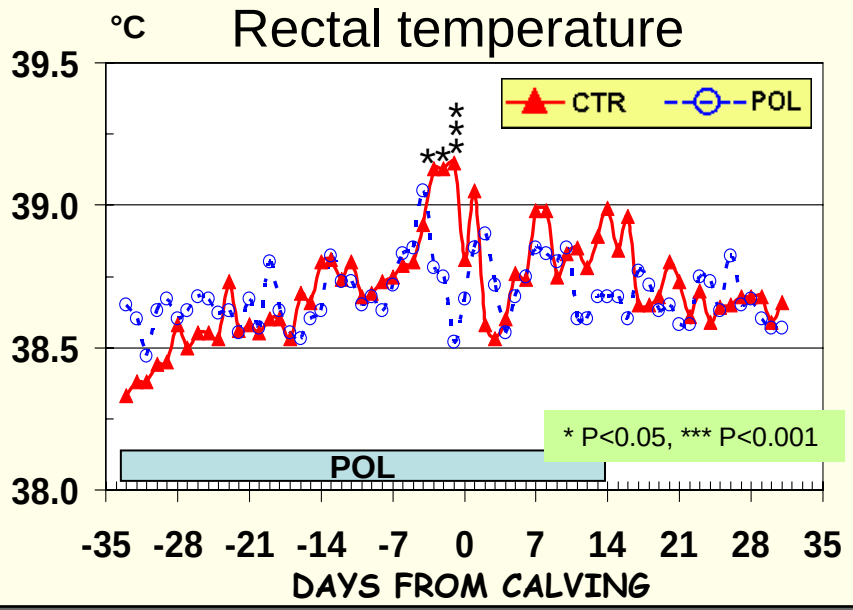
- ✓ **Haematological profile**
- ✓ **wide metabolic profile, including +APP (haptoglobin, ceruloplasmin), -APP (albumin, lipoprotein=cholesterol, paraoxonase) & ROM (Reactive Oxygen Metabolites), antioxydants, fructosamine, metabolites of nitric oxide, etc.**

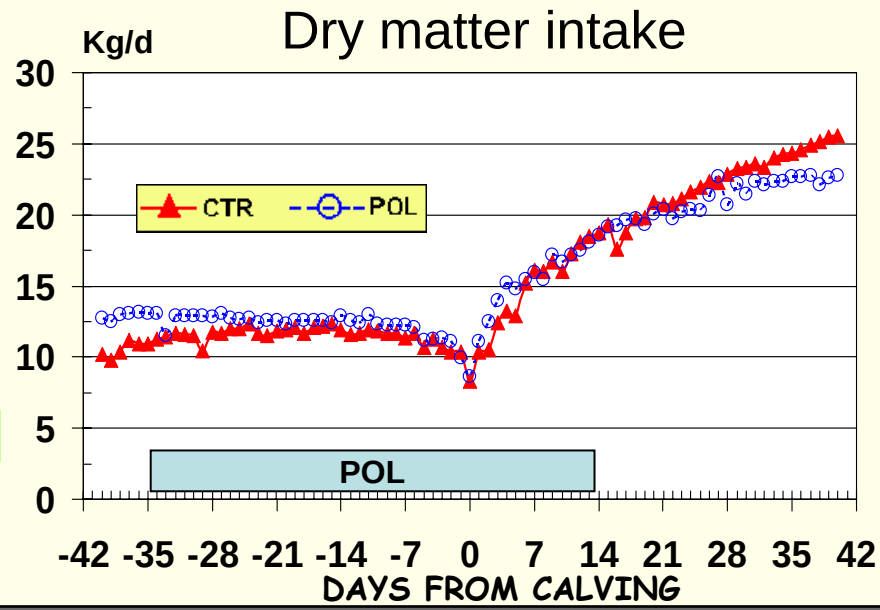
STATISTICAL ELABORATION

ANOVA using a repeated-measure procedure, including treatment (POL & CTR), days from calving (DFC) and their interaction in the model

RESULTS

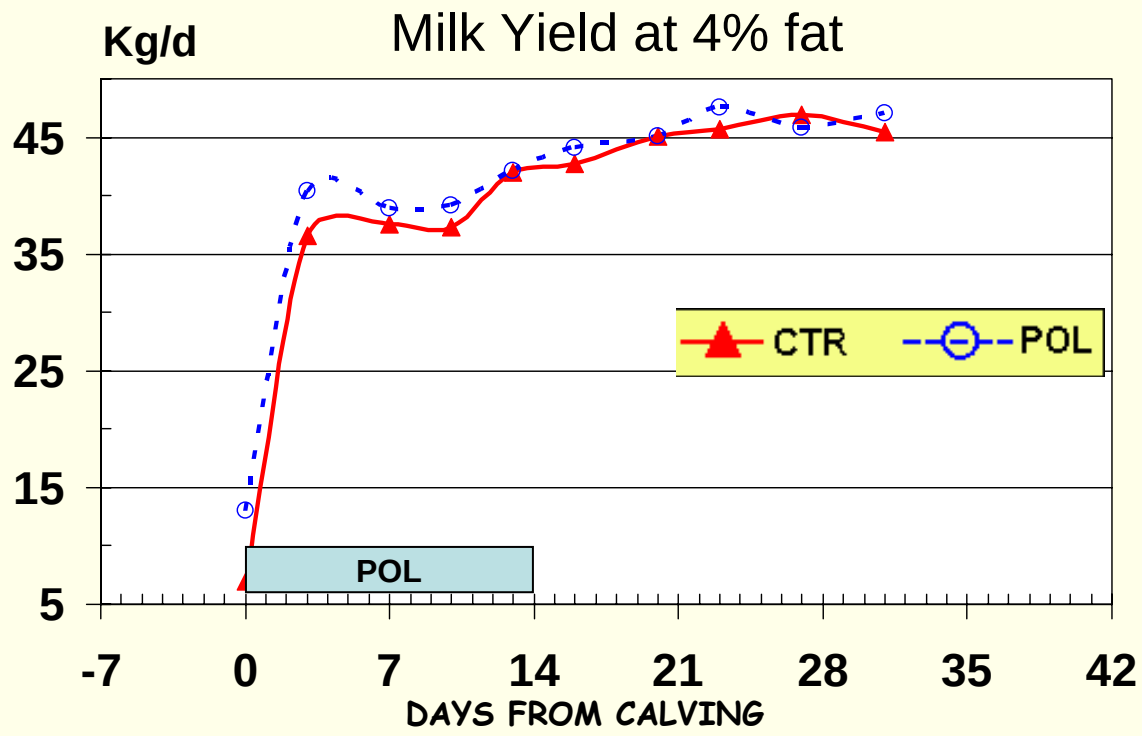
- **Treatment of Polinacea™ (POL):**
  - ✓ **Dosage: 1.41±0.13 g/cow/d**
  - ✓ **Duration: 35 d before calving & 14 d after it (except one cow that refused it after 1 week)**
  - ✓ **Any adverse effect**
- **POL vs CTR showed:**
  - ✓ **lower T° before calving (evident last 4 day before calving)**
  - ✓ **slightly higher DMI & milk yield (first 7 days in milk)**





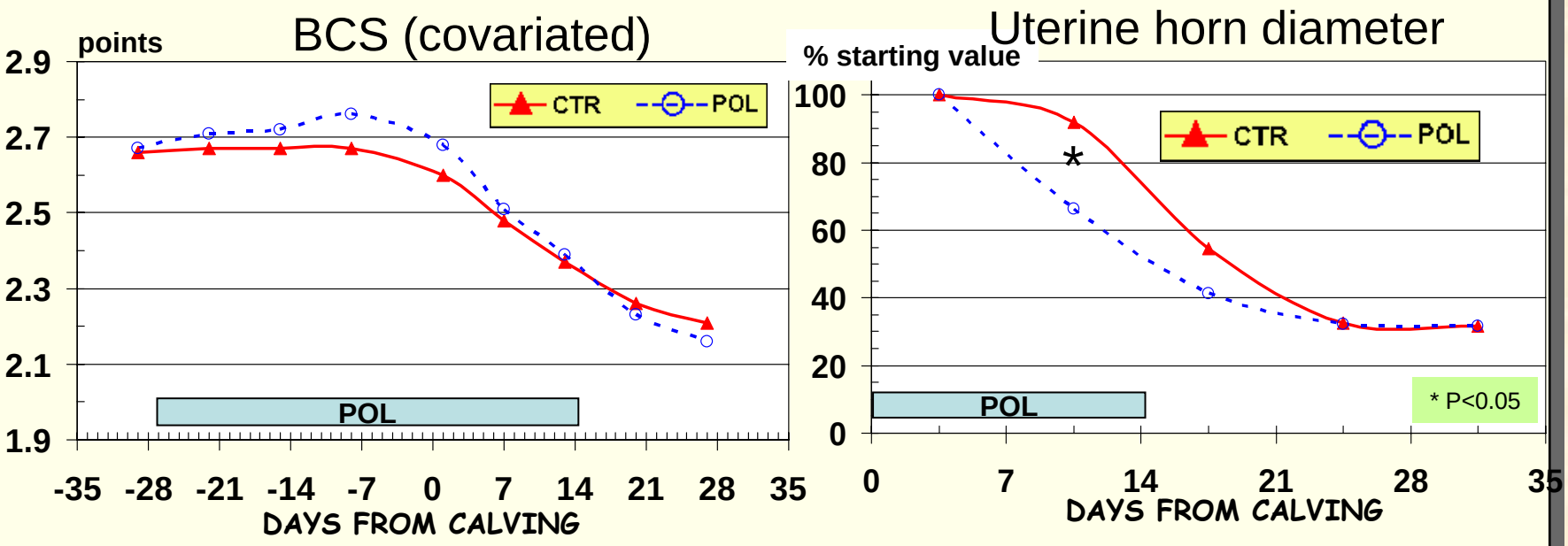
MILK YIELD & QUALITY

- **POL vs CTR showed:**
  - **similar and very low level of Somatic Cell Count**
  - **slightly higher fat and protein contents**
  - **slightly higher milk yield corrected at 4% of fat (NS)**



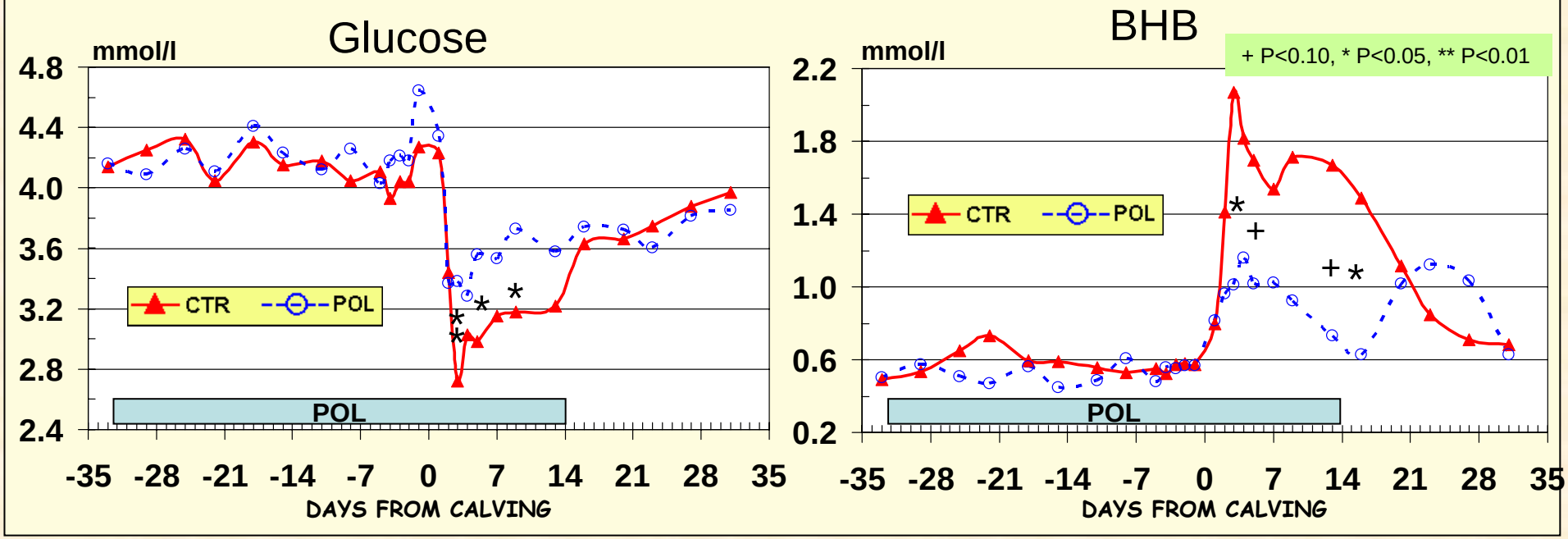
RESULTS

- **POL vs CTR showed:**
  - ✓ **higher body losses in the 1st month of lactation (-0.52 vs -039 points of CTR)**
  - ✓ **faster uterine involution (recovery of the uterine horns and cervix diameters) & follicles with higher size**



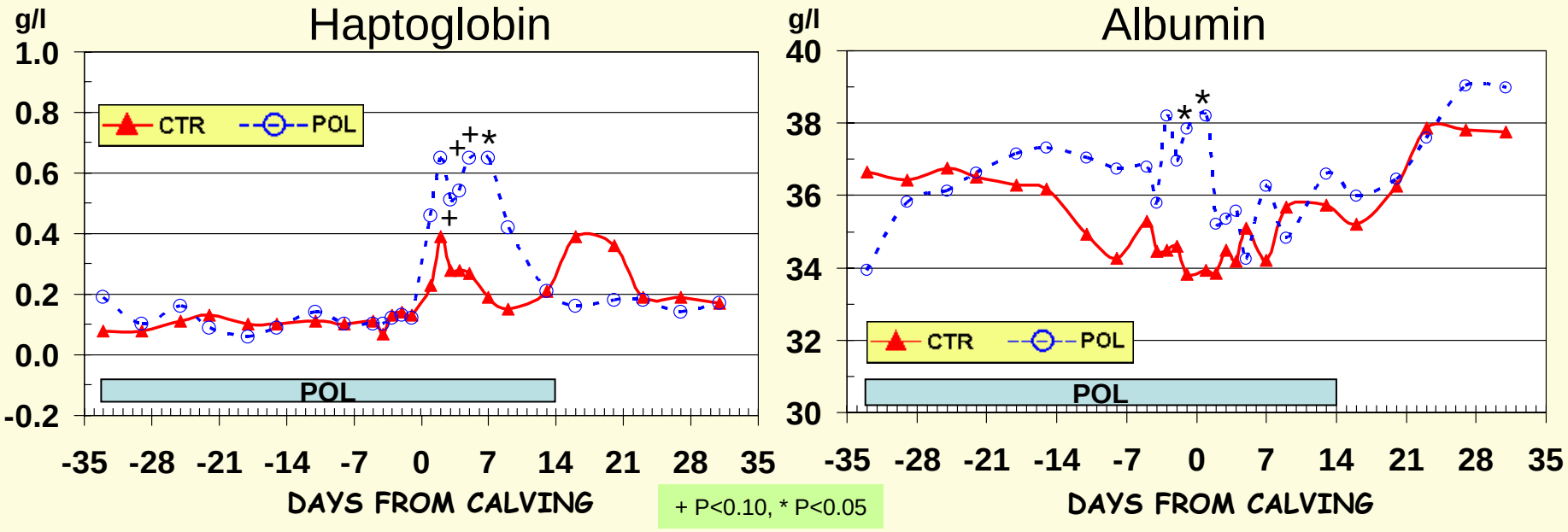
BLOOD INDICES

- **POL vs CTR showed:**
  - ✓ **favourable energy indices till 14th day in milk: higher glucose (and fructosamine) & lower BHB**
  - ✓ **similar level of NEFA, urea & creatinine**



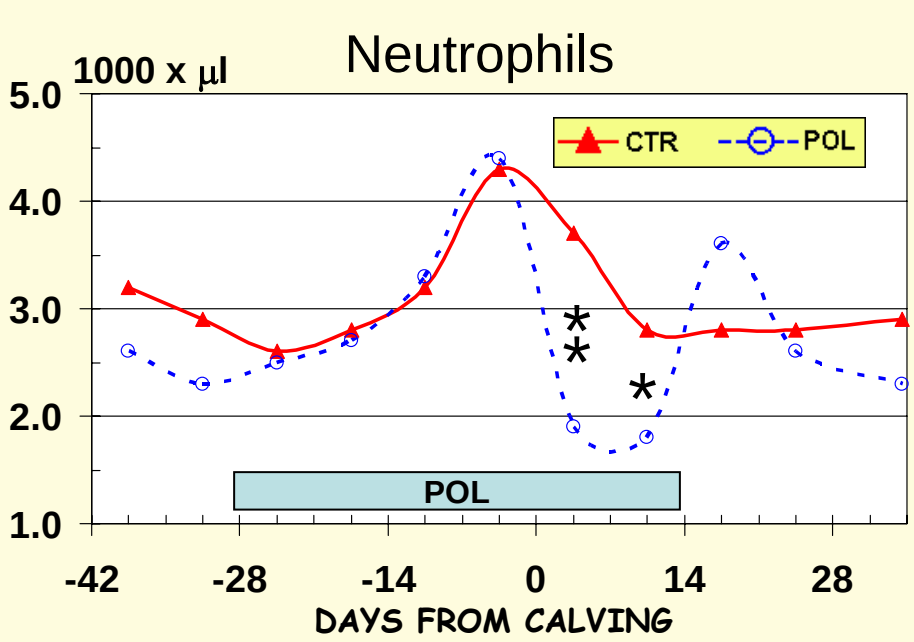
BLOOD INDICES

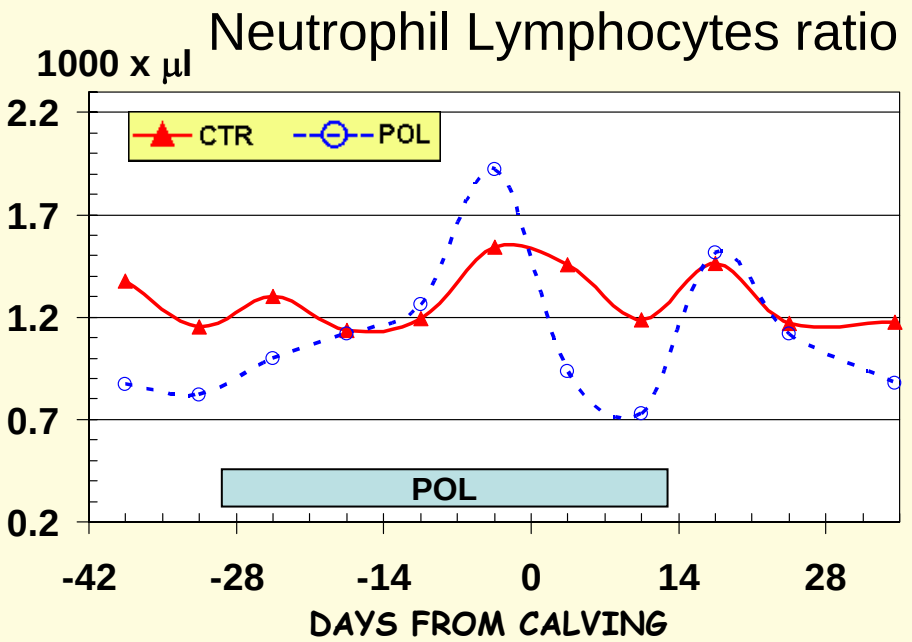
- **POL vs CTR showed:**
  - ✓ **marked raise of +APP (haptoglobin & ceruloplasmin) and ROM immediately after calving, but with quicker recovery**
  - ✓ **smaller reduction of -APP around calving (e.g. albumin) or a tendency to faster recovery during 1st month of lactation (e.g. paraoxonase)**
  - ✓ **smaller reduction of globulin around calving**



HAEMATOLOGICAL INDICES

- **POL vs CTR showed:**
  - ✓ **any difference before calving,**
  - ✓ **higher level of haematocrit after calving**
  - ✓ **marked reduction of Neutrophils (N) and Lymphocytes (L) at the beginning of lactation**
  - ✓ **N/L ratio more favourable (<1) after calving (during treatment)**
  - ✓ **a "rebound" of lymphocytes (mainly justified by ↑ of Neutrophils), after the suspension of treatment**





DISCUSSION

- *The extract of Echinacea Angustifolia at the dosage of 2 mg/kg BW*
  - ✓*has been eaten without problems*
  - ✓*has not determined adverse effects at rumen level (data not published)*
  - ✓*did not cause any health problem*
- *The treated cows have also showed favourable conditions around calving in comparison to control:*
  - ✓*accelerated uterus involution*
  - ✓*ameliorated energy balance, as confirmed by some blood indices (e.g. glucose & BHB) and the slightly higher DMI as well as the similar milk yield level with a better slightly composition;*
  - ✓*attenuated inflammatory response around calving (still occurring and perhaps higher), as confirmed by the lower reduction of –APP that typically occurred at calving time*

DISCUSSION

- ✓ *The better immune status as demonstrated by:*
  - *lower levels of the neutrophils after calving and the lower neutrophil-lymphocytes ratio*
  - *higher haematocrit level ➲ lower consequences of inflammation events*

➢ *Nevertheless, some contradictory aspects emerge from:*

- ✓ *higher raise of +APP after calving*
- ✓ *prolonged storage lipomobilization*

that require more investigations

➢ *After the end of the treatment, the major part of the effects do not disappeared*

CONCLUSIONS

- *These preliminary results have showed favourable effects of Polinacea™ supplementation on periparturient dairy cows at metabolic, immune and milk (yield & composition) level*
- *Namely, it has been confirmed that inflammations occur "as usual" and that anti-inflammatory phyto-extract reduces their effects*
- *Nevertheless, our results demonstrate the utility to explore the use of phyto extracts – mainly in transition period - to maintain in good activity the immune system and/or to attenuate inflammation consequences*

Acknowledgements

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