UNIVERSITEIT GENT

FACULTY OF **BIOSCIENCE ENGINEERING**

Fatty acids to mitigate methane emissions in ruminants

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FLANDERS INNOVATION & ENTREPRENEURSHIP

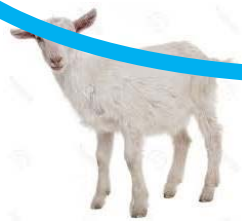
Flanders State of the Art

ILVO Institute for Agricultural and Fisheries Research

TOPIC AND HYPOTHESIS OF PhD

methane

- Methane reduction in agriculture
  - Ruminant animals
    - Nutritional intervention
      - "Early Life Programming"
        - Postnatal intervention
        - Pre and postnatal intervention



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2

GOAT TRIAL

PRENATAL TREATMENT
Last 3 weeks of dry-off

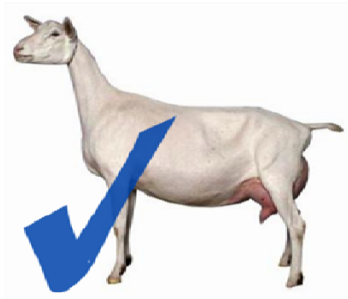
POSTNATAL TREATMENT
Birth→ 2 weeks after weaning

D-

N=10

N=10 → **k-** → **D-k-**

N=10 → **k+** → **D-k+**



D+

N=10

N=10 → **k+** → **D+k+**

N=10 → **k-** → **D+k-**

KIDS

- MR intake
- Growth
- Methane and VFA
- Papillae development

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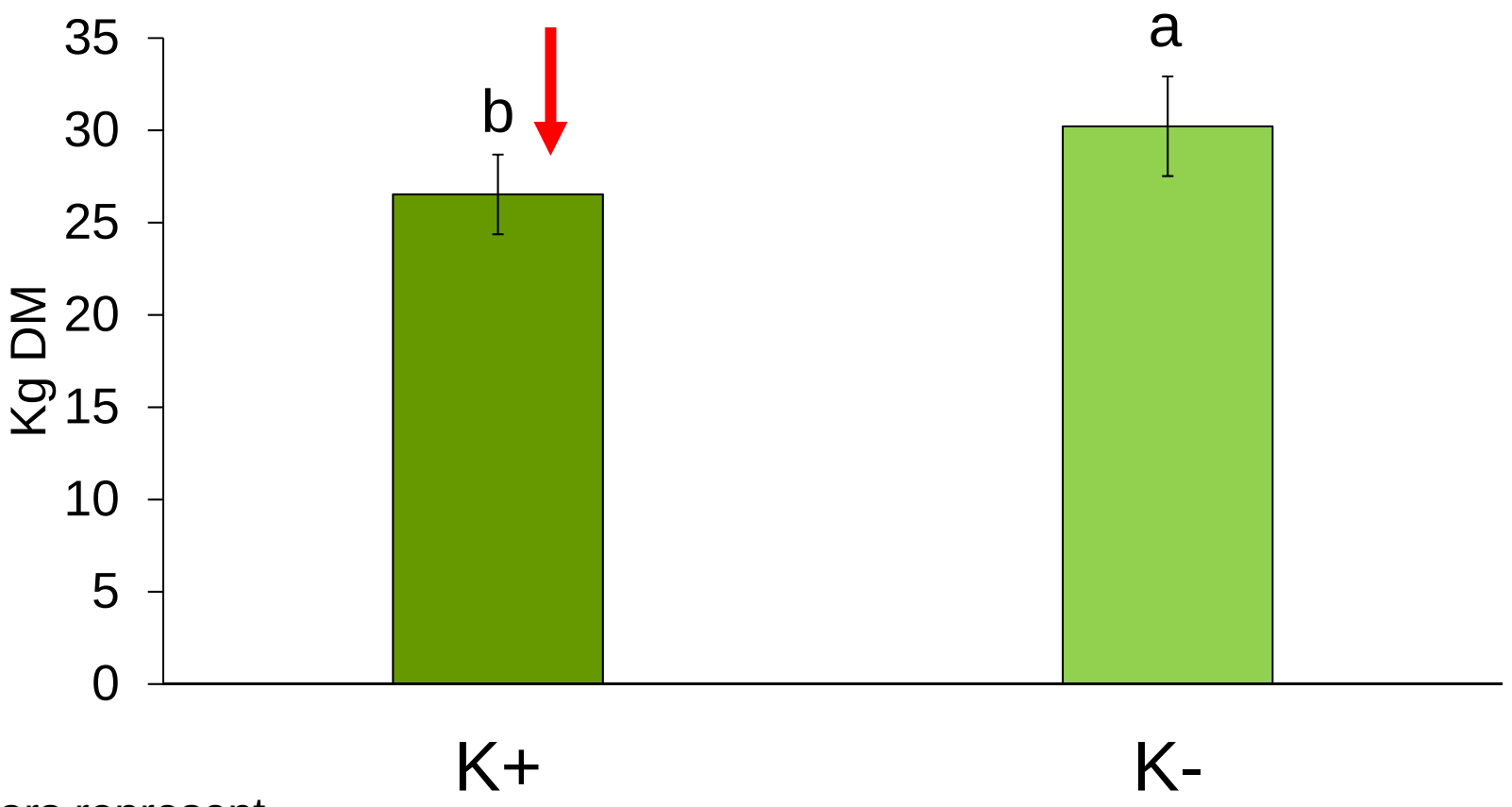
Supplement=
non-esterified saturated medium chain fatty acids from coconut oil (47% C12:0, 18.5% C14:0)

Results: Milk replacer intake

Negative postnatal treatment effect: p=0.004



Error bars represent standard deviations

Results: growth

	DOE +		DOE –	
Parameter	**Kid +**	**Kid –**	**Kid +**	**Kid –**
Daily growth until weaning: 9 weeks (g/day) **(Kid effect p=0,0005)**	175,7	216,6	177,7	215,0
Weaning weight (kg): 9 weeks **(Kid effect p= 0,0025)**	15,18	17,72	15,34	17,52
Weight at 12 weeks/ 3 months (kg) **(Kid effect p =0,0065)**	21,71	24,63	20,99	23,67
End weight: 6 months (kg) **(Kid trend p= 0,089)**	31,86	33,32	29,15	32,28

Methane measurements: *in vitro* incubations

- Fresh rumen fluid by oesophagal stomach tube and vacuum pump
- Mixed with phosphate bicarbonate buffer (1:4 ratio)
- 200 mg grass silage
- CO_2 atmosphere
- Incubate 24h (39°C, shaking)

- pH, gas measurements and VFA measurements (gas chromatography)

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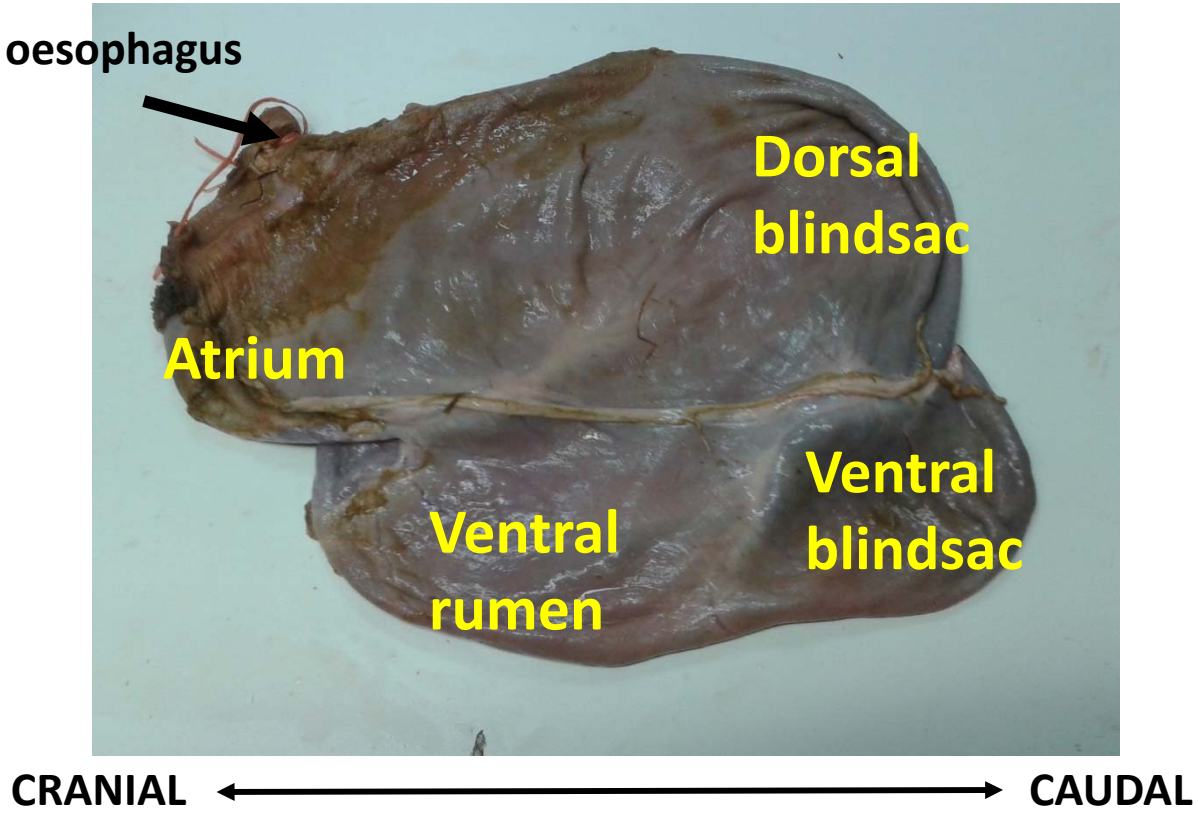
Results: *in vitro* incubations

	Age	Abs. CH_4	Total VFA	CH_4/total VFA
TREATMENT PERIOD	**1 MONTH**	D+K+ ↓	D+K+ ↓	D+K+ ↓ -81%
NO TREATMENT	**6 MONTHS** PROGRAMMING	D+ ↓	✖	D+ ↓ -25%

Results: papillae development

- 6 months old
- Papillae development: 4 zones in the rumen



- Density (number/cm^2)
- Length
- Width

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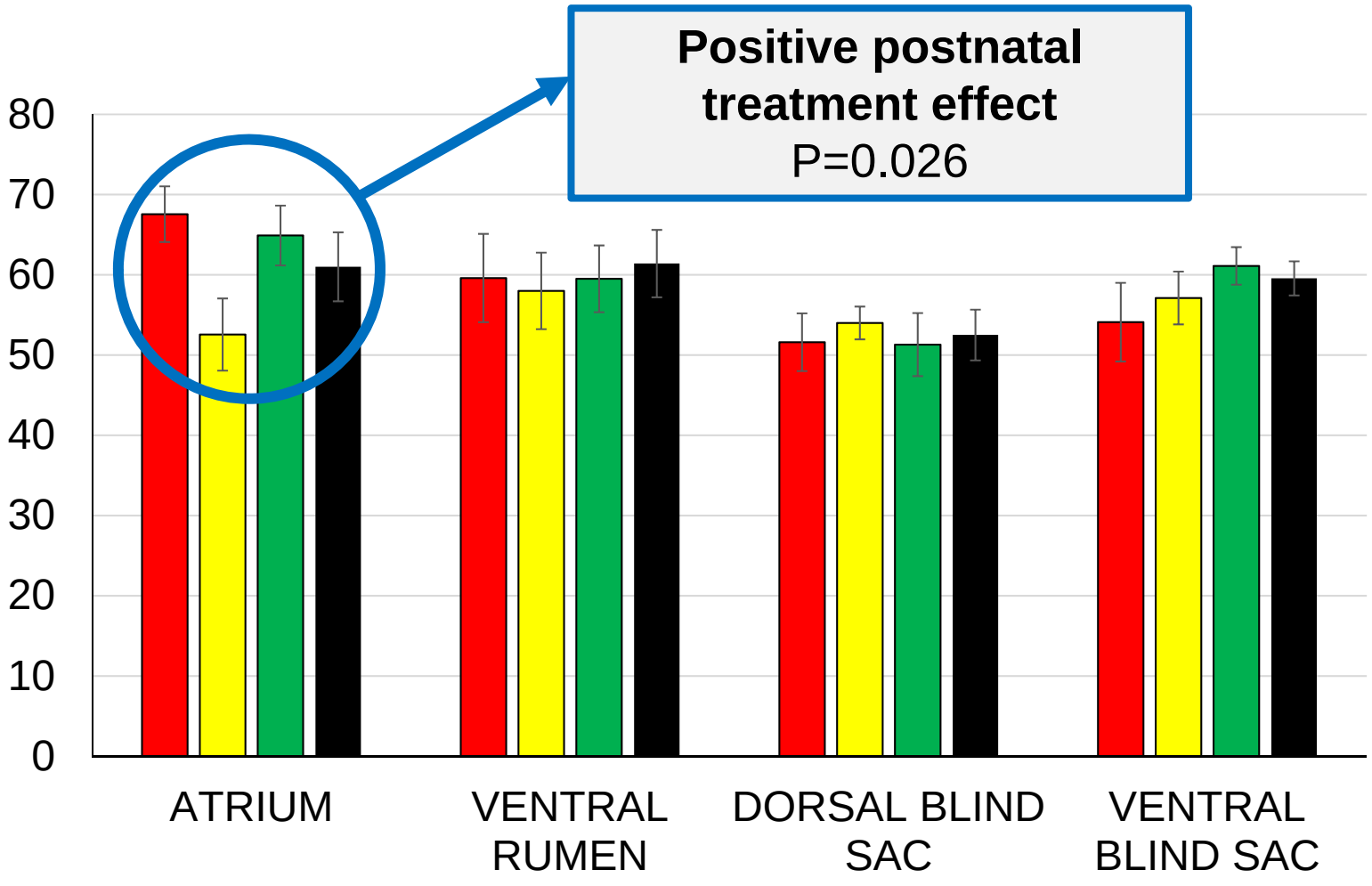
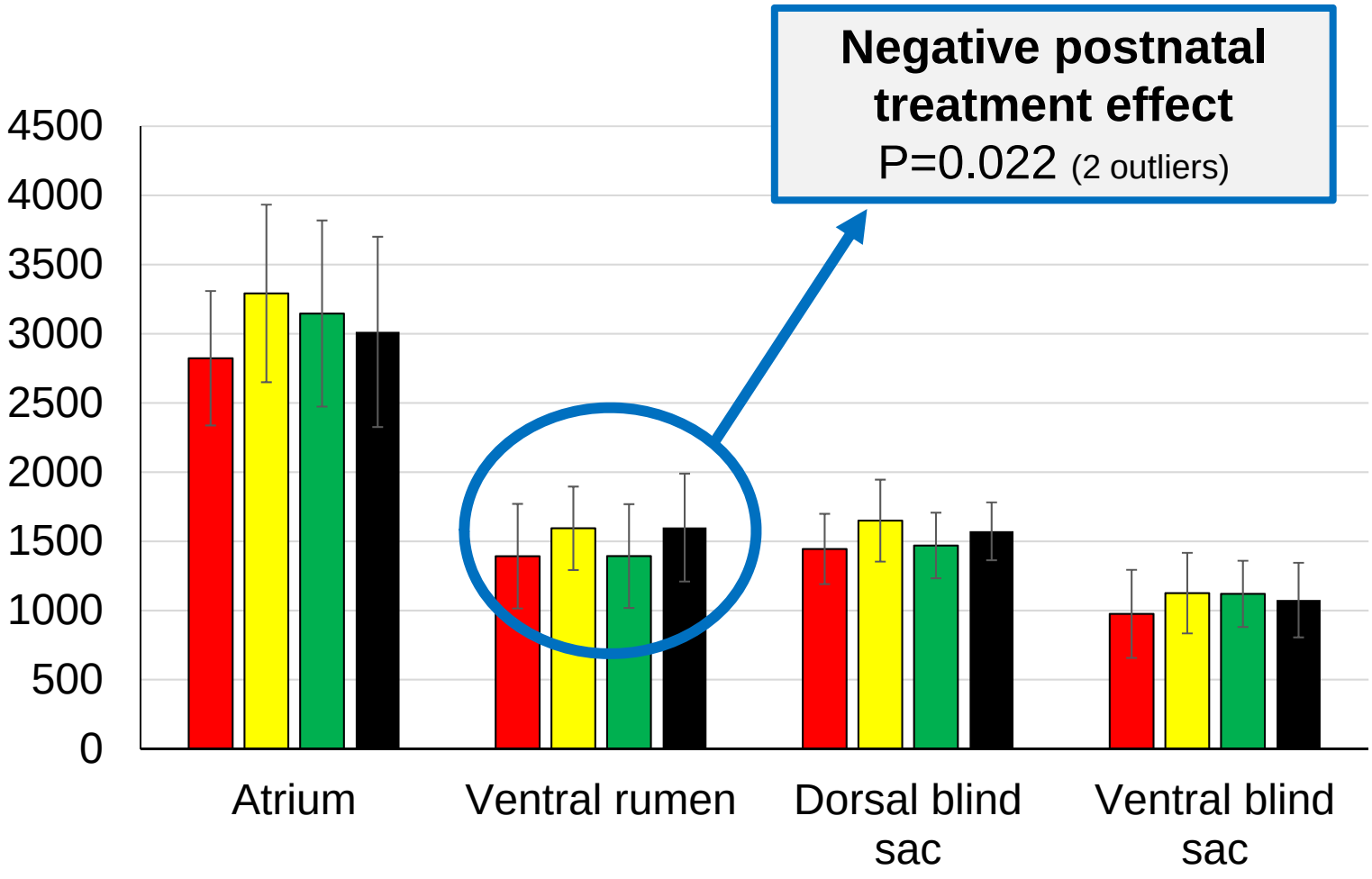
Results: papillae DENSITY



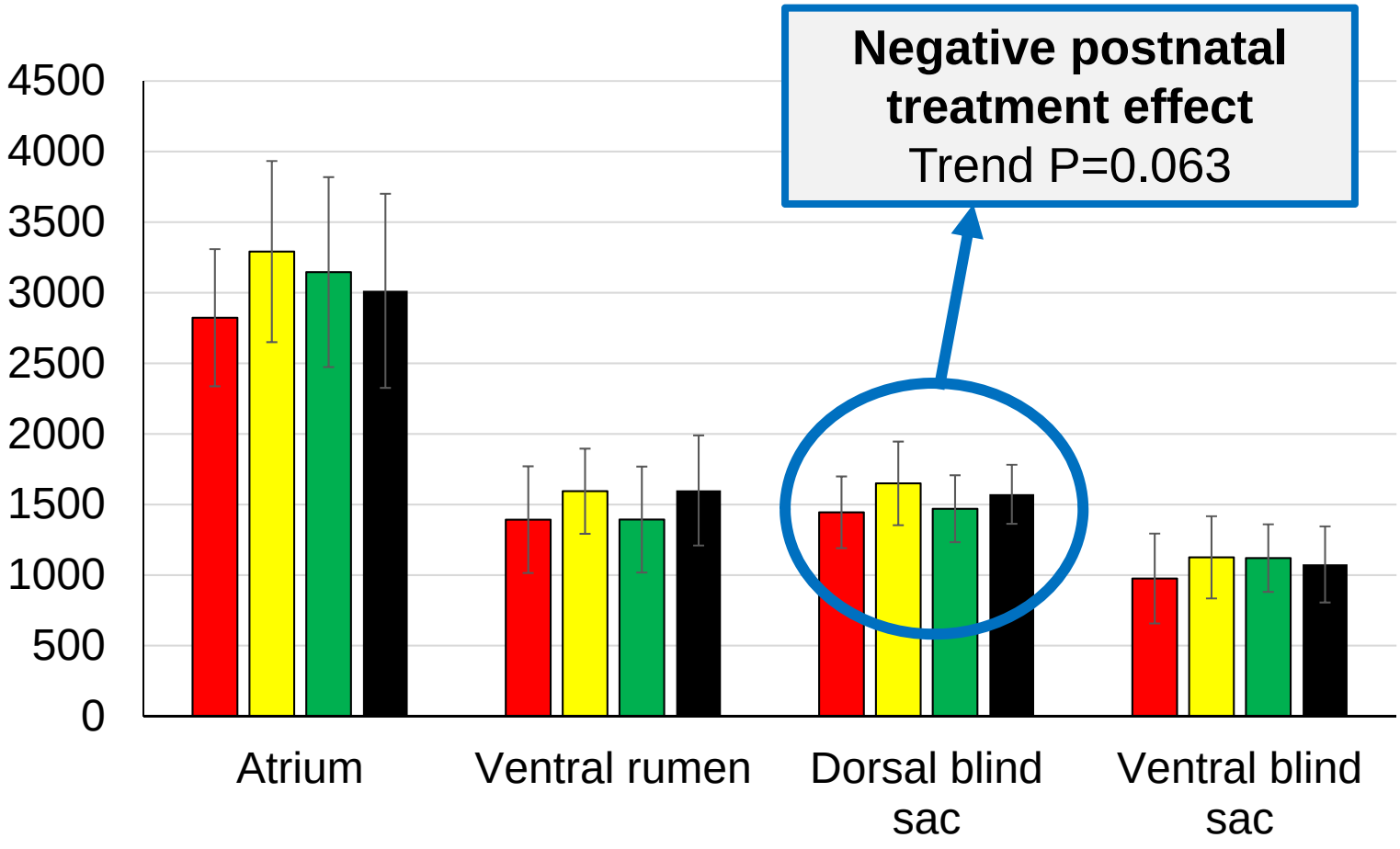
Error bars represent standard deviations

Results: papillae LENGTH



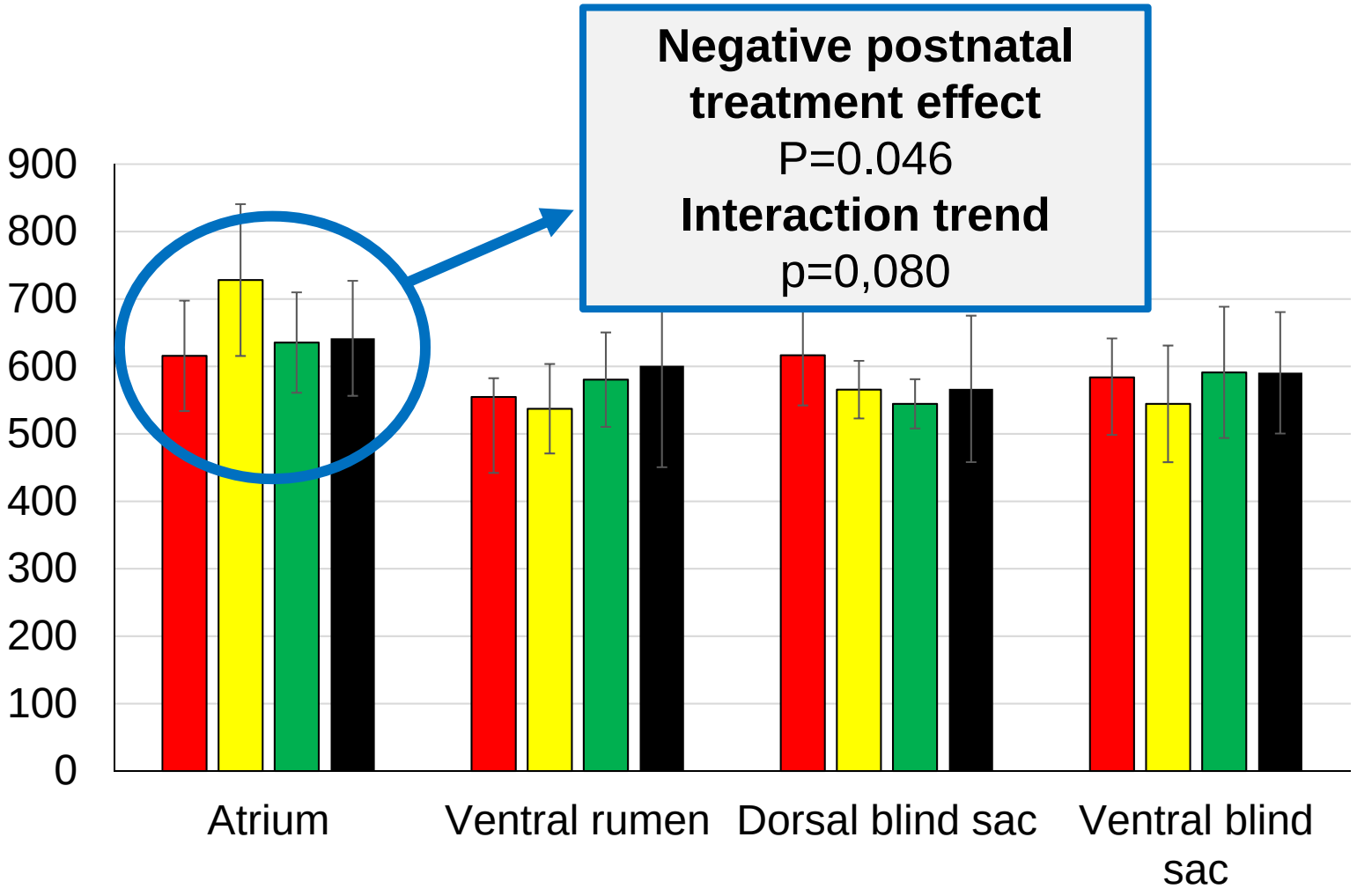
Error bars represent standard deviations

Results: papillae LENGTH



Error bars represent standard deviations

Results: papillae WIDTH



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Discussion preliminary results goat trial

APPROX. 4 MONTHS AFTER POSTNATAL TREATMENT STOPPED…

- Prenatal treatment effect: lower absolute CH_4 (-23%) and lower CH_4/total VFA (-25%)
- Postnatal treatment effect: differences in papillae development (density, length and width)

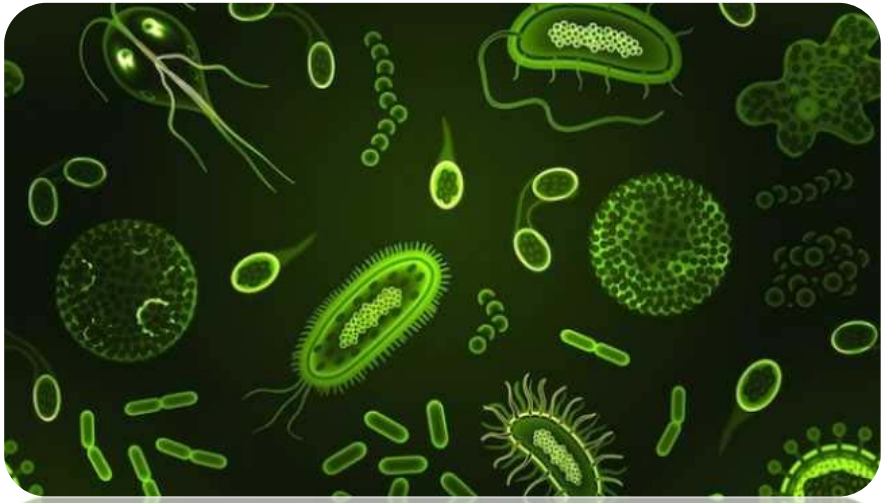
HOWEVER

Negative effects of postnatal supplementation of coconut MCFA:

- Feed intake
- Growth and body weight
- Fermentation capacity in the rumen (total VFA)

Future investigations

- Microbial communitiy structure
  - Abundance and diversity of main microbial groups
  - Activity of methanogens



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Thank you

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