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Session 20 – Functional feed additives in poultry nutrition



divas

DEPARTMENT OF VETERINARY
MEDICINE AND ANIMAL SCIENCES

Chicken immune cell assay to evaluate the immune-modulating effect of grape by-products

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- **Availability of poultry proteins** will grow more rapidly (+17.8%) than other meat sources (doi: 10.1787/19428846-en)
- Chicken production is looking for **antibiotic alternatives** to face **antimicrobial resistance**
- Effect of antibiotic alternatives:
 - Direct cytotoxic against infectious agents
 - Removal of pathogenic toxins
 - Augment host immunity and gut health → **Phytochemicals**
- Phytochemicals can be used as **immunomodulating feed additives** (doi: 10.1016/j.anifeedsci.2018.09.016; doi: 10.1007/s00203-022-02862-5)

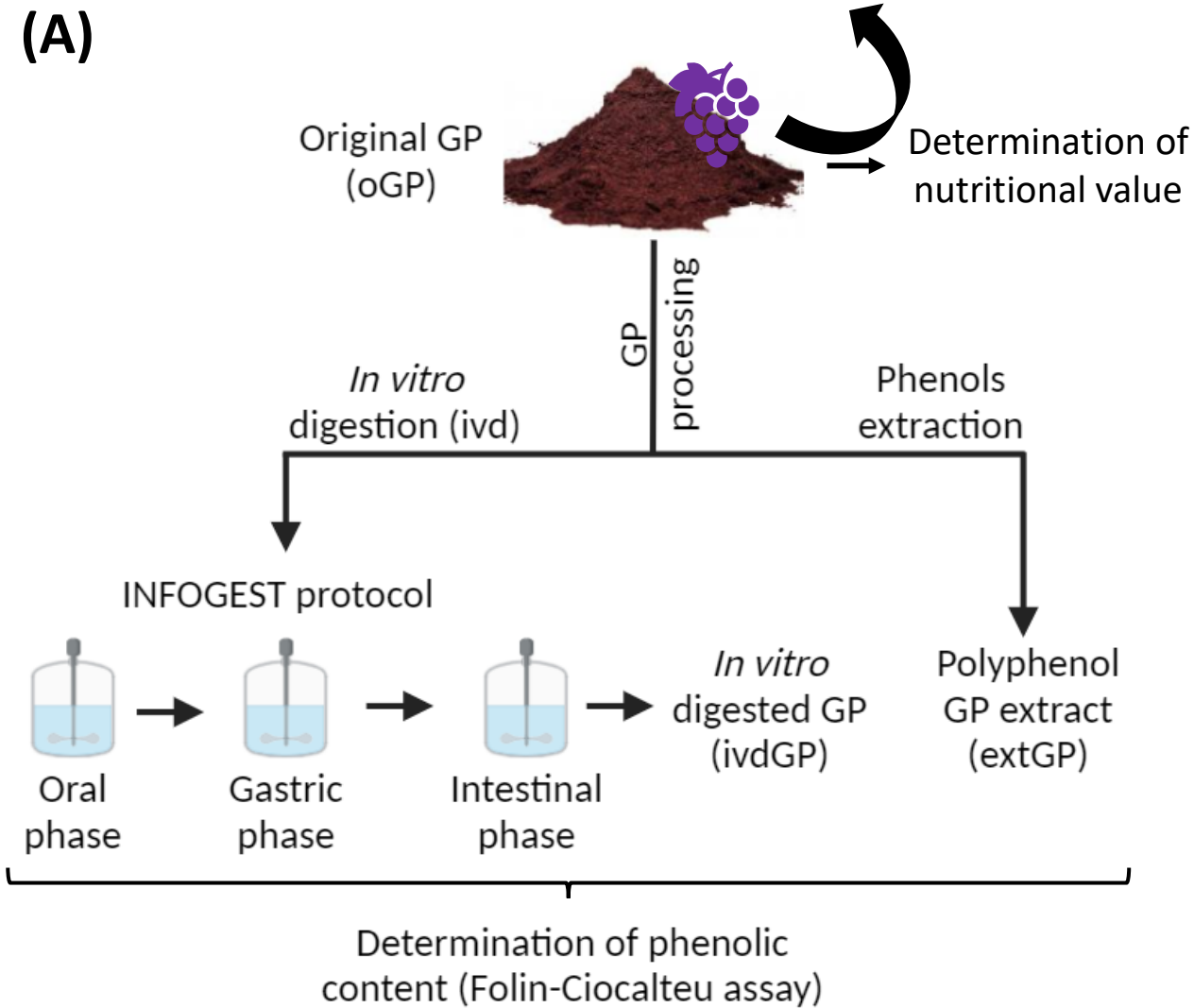


- **Grape production:**
 - 2% annual increase of global production from 2014 to 2023
 - 2023 → 28.1 million metric tons of grape produced at global level
(fas.usda.gov/data/production/commodity/0575100)
- 30% of grape production → **Grape by-products (GP)** originating after pressing grapes to produce wine (doi: 10.3390/antiox11102025)
 - GP are rich in phenolic compounds and **phytochemicals**
 - Previous research → **Antioxidant and antimicrobial properties** of GP used as **feed supplement** (doi: 10.3390/ani12172239)

- Characterization of grape pomace (A)
- Application of an in vitro model based on chicken immune cells to observe the potential immunomodulating effect of grape pomace in different forms that could affect the immune response of the chickens (B)

Dried and ground not fermented white marc

Methods



- Nutritional characterization:

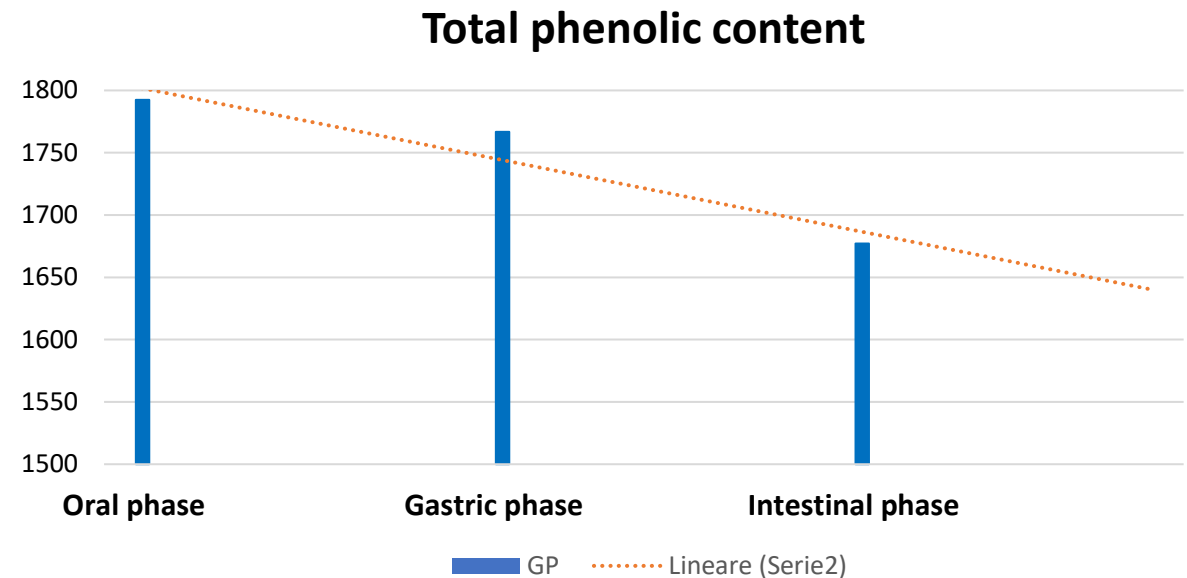
Item	DM	EE (%DM)	CP (%DM)	NDF (%DM)	ADF (%DM)	ADL (%DM)	Ash (%DM)
GP	91,01	7,77	12,45	59,02	52,69	42,36	4,49

Similar to the values reported on feedtables.com

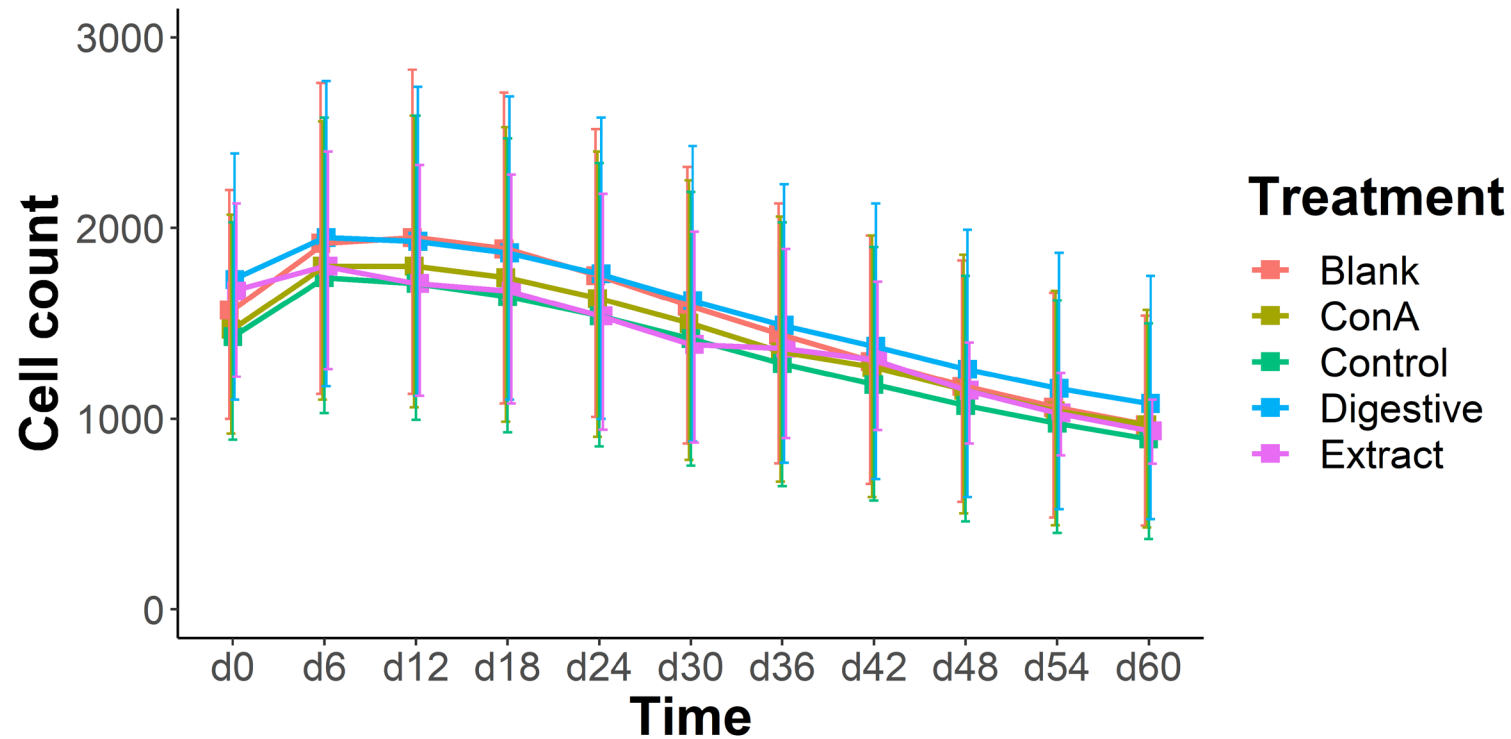
- In vitro DM digestibility → **19,12%**

- Total phenolic content:

- **extGP** → **4380.1** mg TAE/100g ± 316.5 (extraction EtOH - H2O 70:30, 72 h, RT)
- **ivdGP** → **1397.3** mg TAE/100g ± 340.9

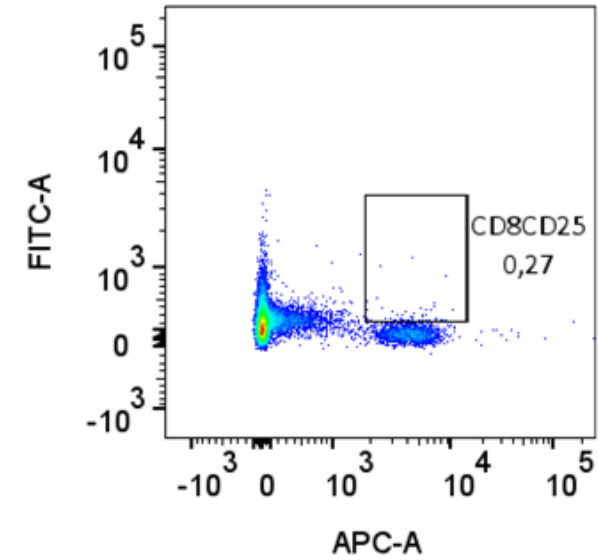
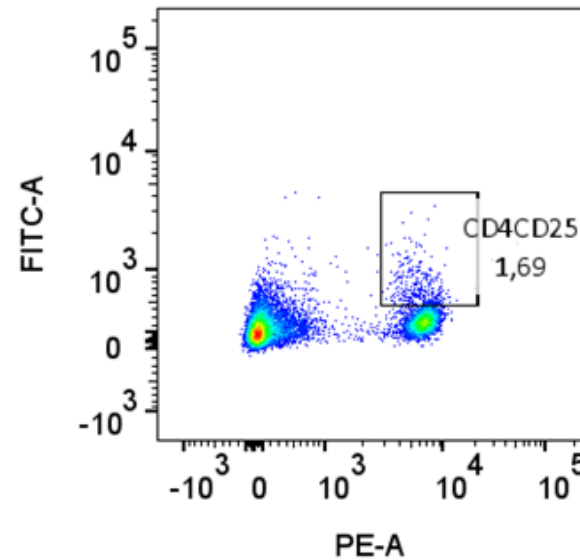
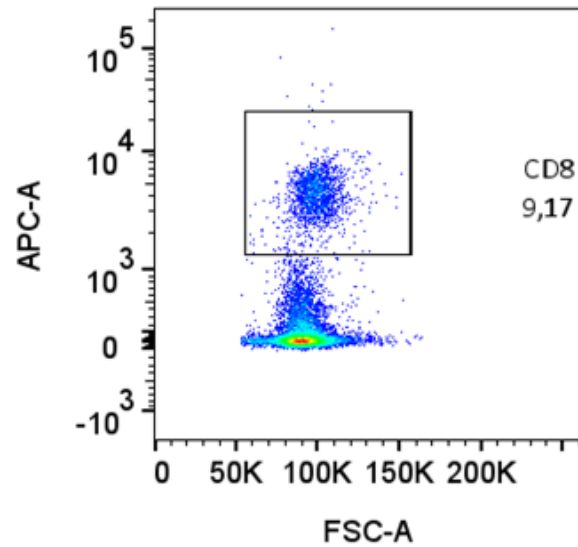
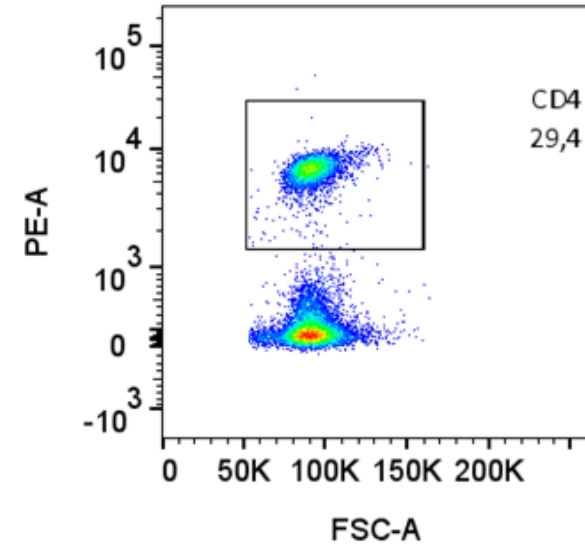
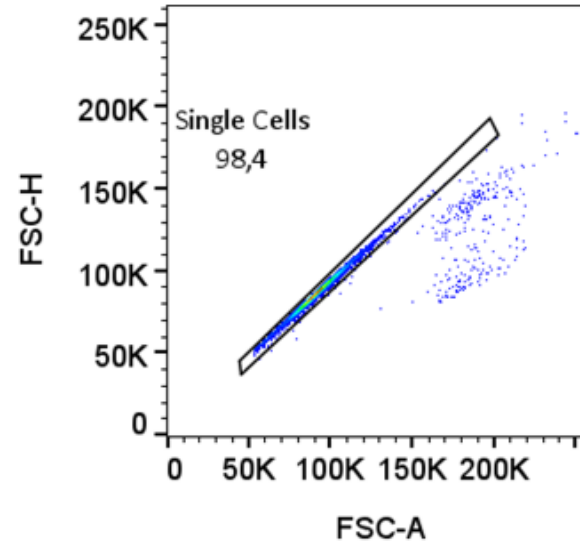
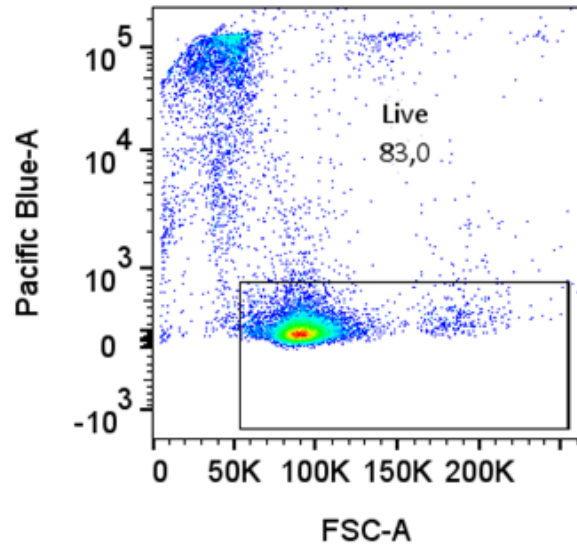


- Real-time monitoring of cell growth (Incucyte):



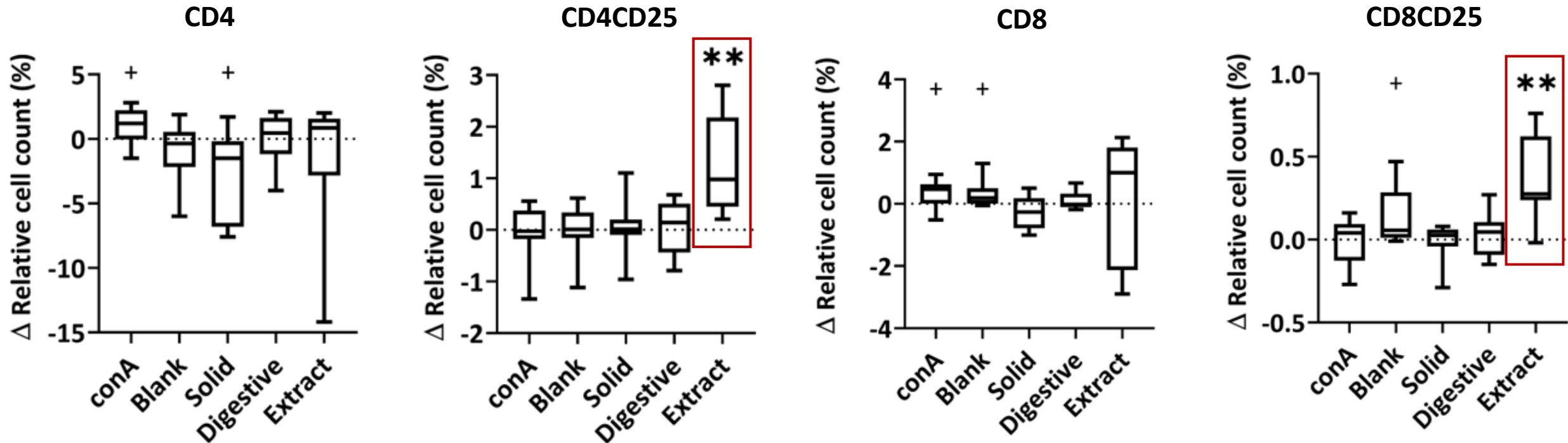
- **No significant variation in cell growth** after all treatments over 60 h monitoring

Control



Results (B)

- Immunophenotyping (flow cytometry T cells):



- **extGP** treatment significantly **increased** the proportion of **activated CD4+CD25+** and **CD8+CD25+** T cells ($P < 0.01$) compared to control

- GP:
 - **low DM digestibility**
 - Considerable quantity of **phenolic compounds**
- **extGP treatment → positive immunomodulation** of chicken CD4 and CD8 T cells:
 - Non-quantitative but qualitative change in chicken PBMC

↓
No more CD4 and CD8 T cells

↓
More activated CD4CD25 and CD8CD25 T cells
- GP as feed additive for chicken:
 - Potential use as immunomodulatory agent in immune response
 - Further research on GP phytochemicals' bioavailability after digestion

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Prof. Susanne Kreuzer-Redmer
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Thank you

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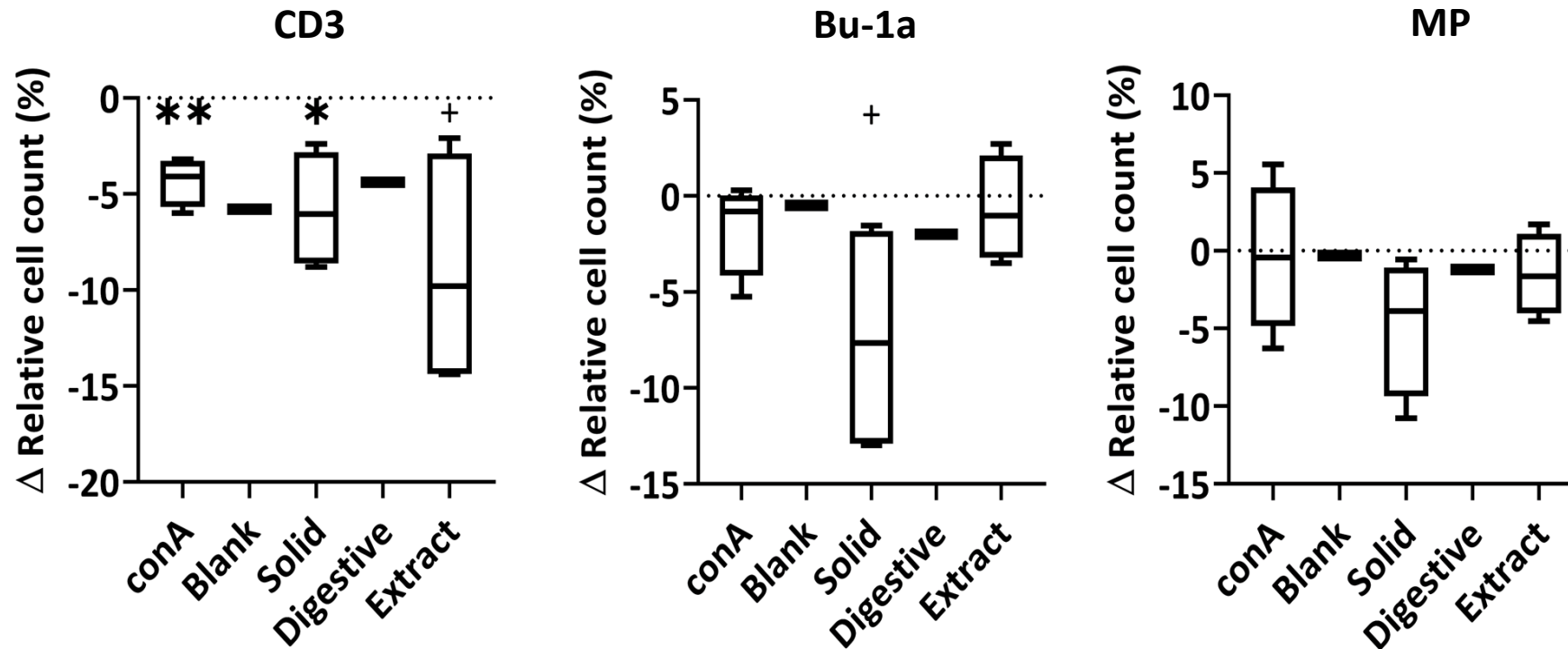




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- Immunophenotyping (flow cytometry B cells):



➤ extGP did not significantly affect B cells