



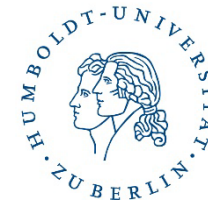
Unveiling the Immunomodulatory Potential of Probiotic *Bacillus* Strains in Chicken Peripheral Blood Mononuclear Cells

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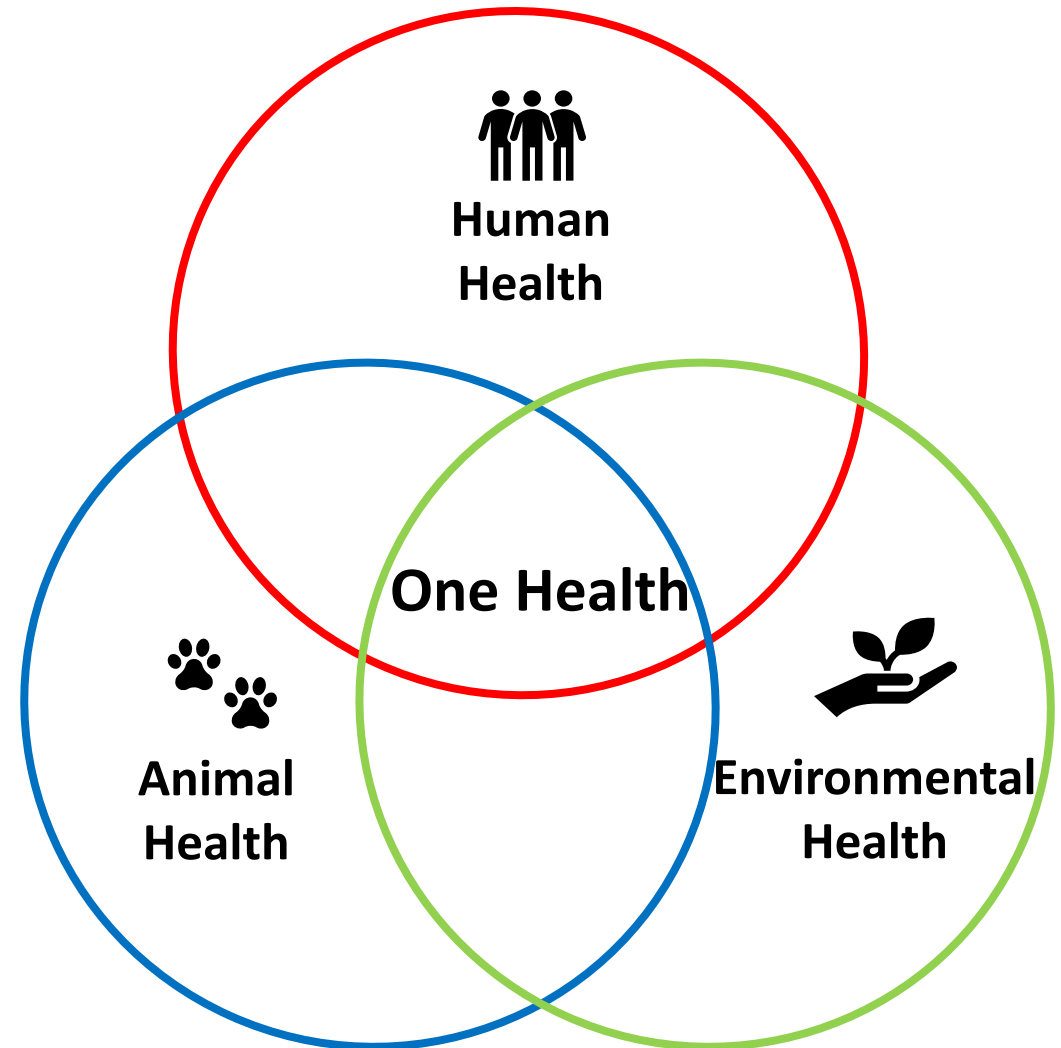
³ Veterinärmedizinische Universität Wien



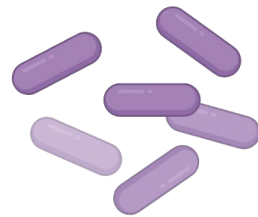
EAAP
September 1st, 2024

vetmeduni

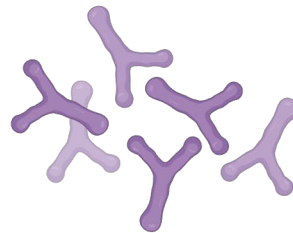
- Interdisciplinary approach
- Antimicrobial resistance
- Probiotics as alternative



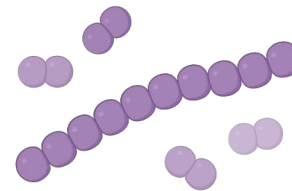
- **Probiotics:** Live microorganisms administered at appropriate amounts confer a health benefit to the host (FAO/WHO, 2002)
 - **Species- and strain-specific**



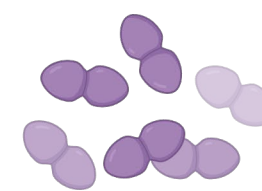
Lactobacilli



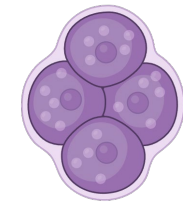
Bifidobacteria



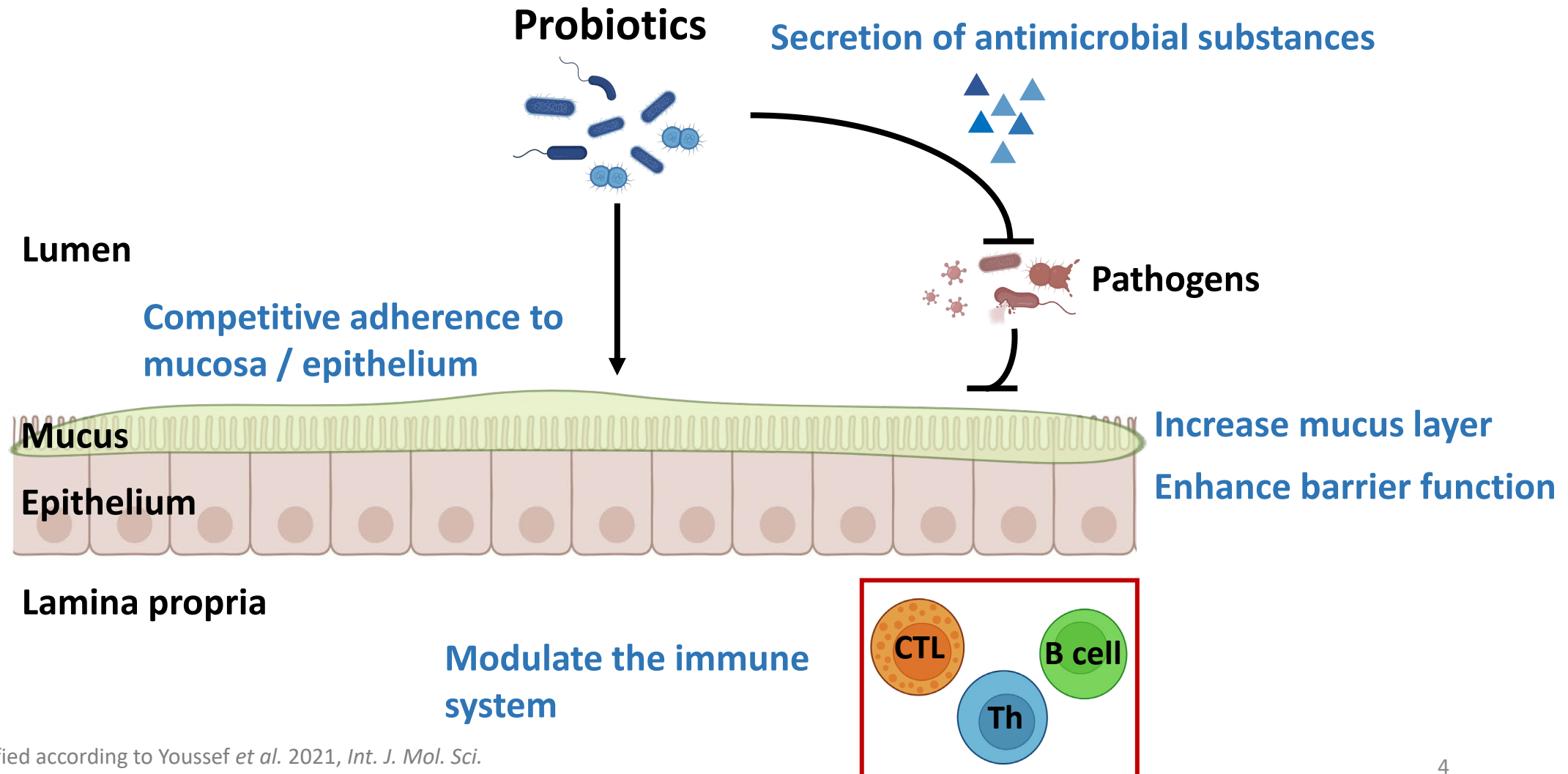
Lactococci

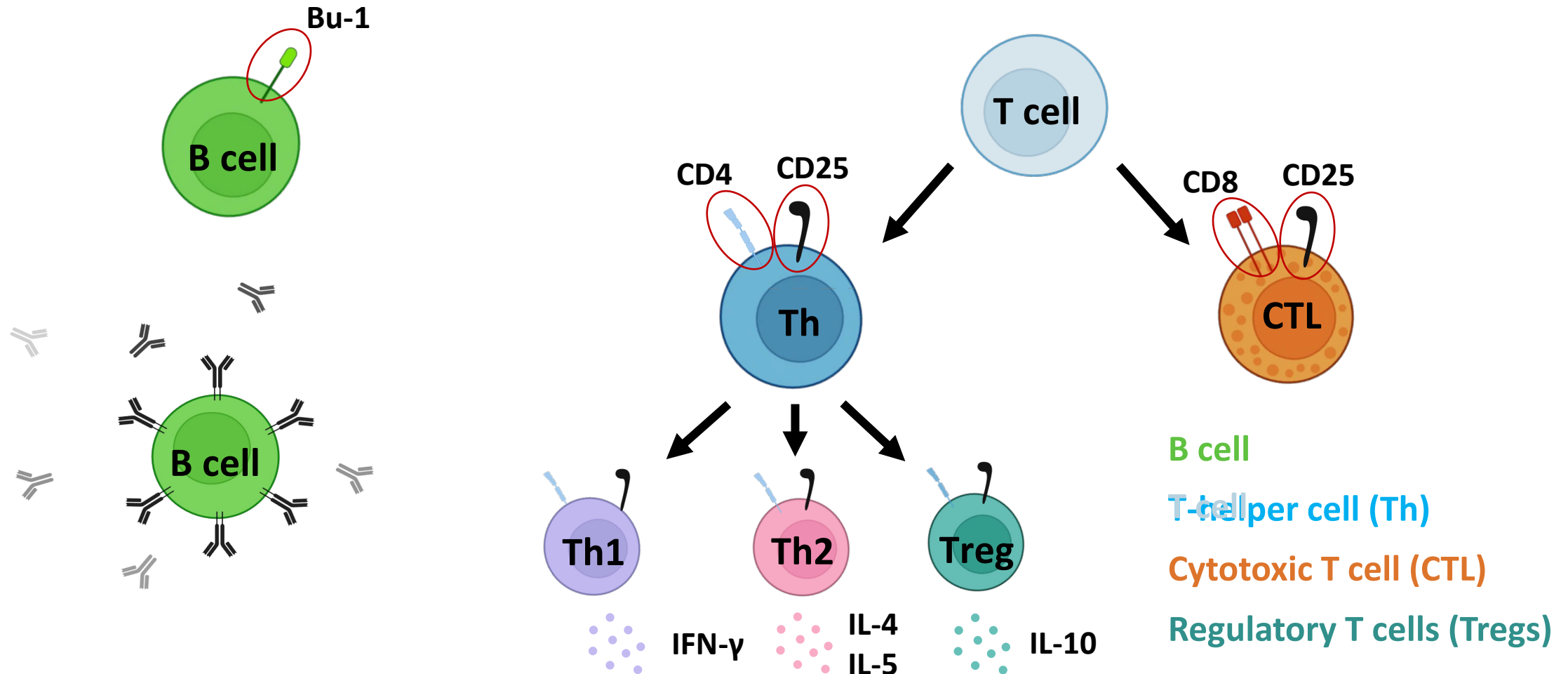


Enterococci



Saccharomyces

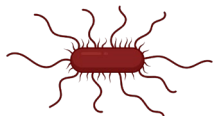




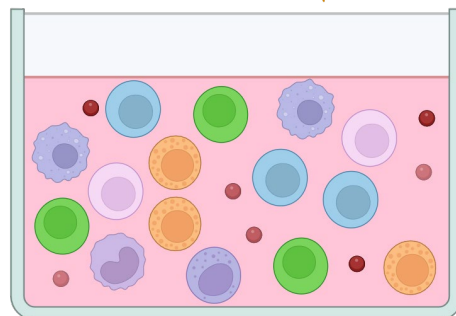
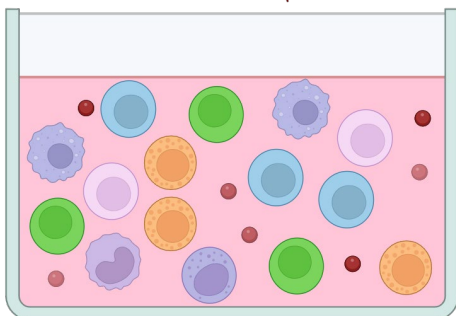
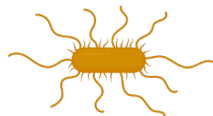
Do *Bacillus* strains modulate adaptive immune responses in chicken?

PBMC treatment with probiotic bacteria

BS



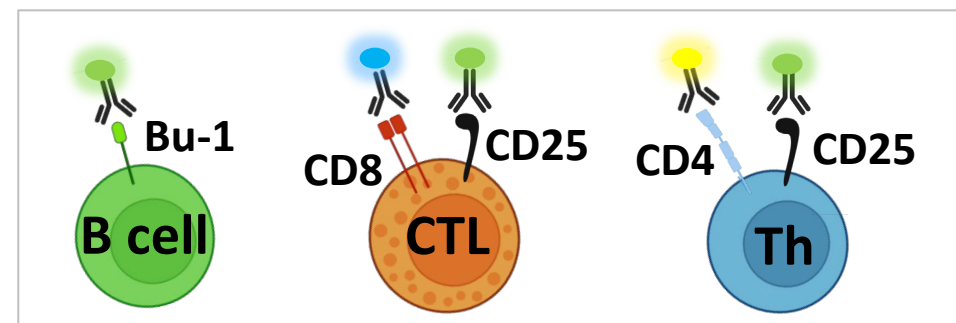
BV



Peripheral blood mononuclear cells (PBMCs)

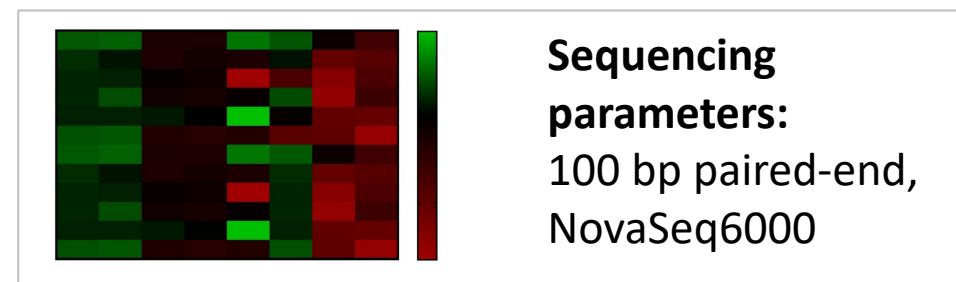
***B. subtilis* (BS), *B. velezensis* (BV)** (Evonik Operations GmbH)
Ratio: 1:3 (PBMC:*Bacillus*)
Cultivation: 24 h

Flow cytometry



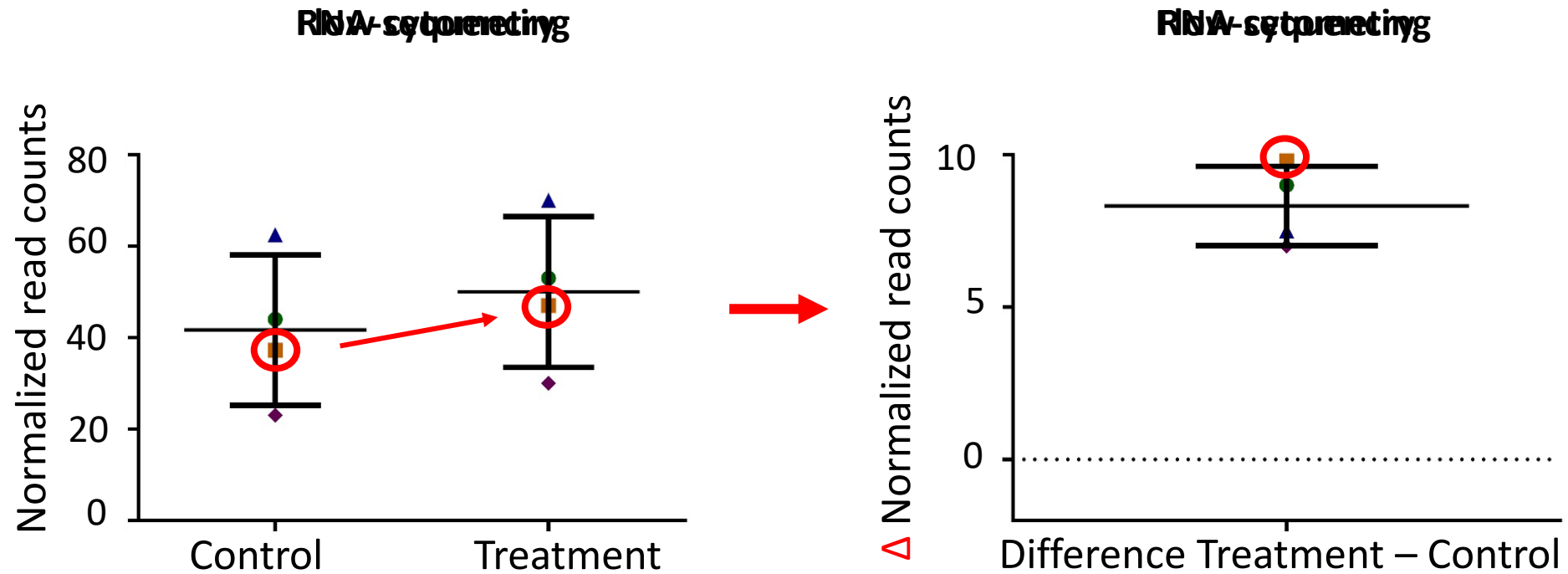
Influence on immune cell differentiation and activation status

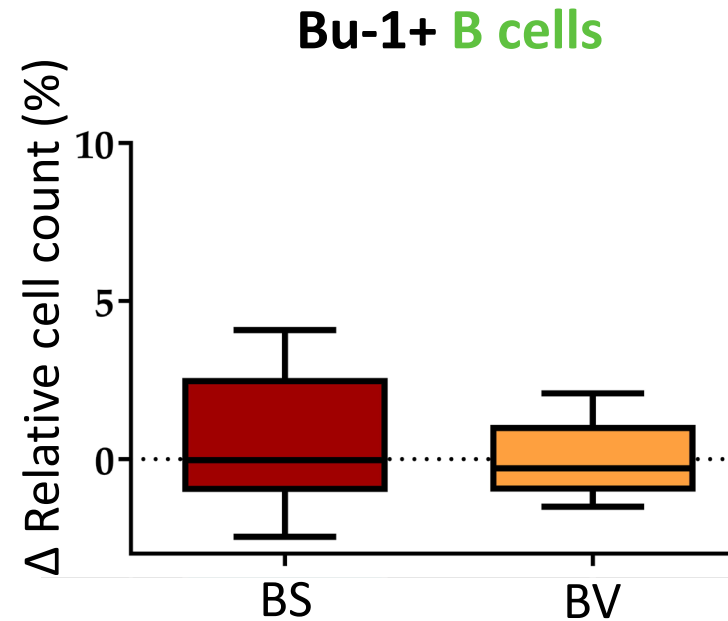
RNA-sequencing and expression analysis



Influence on immune cell surface marker gene expression

Data normalization on the respective negative control

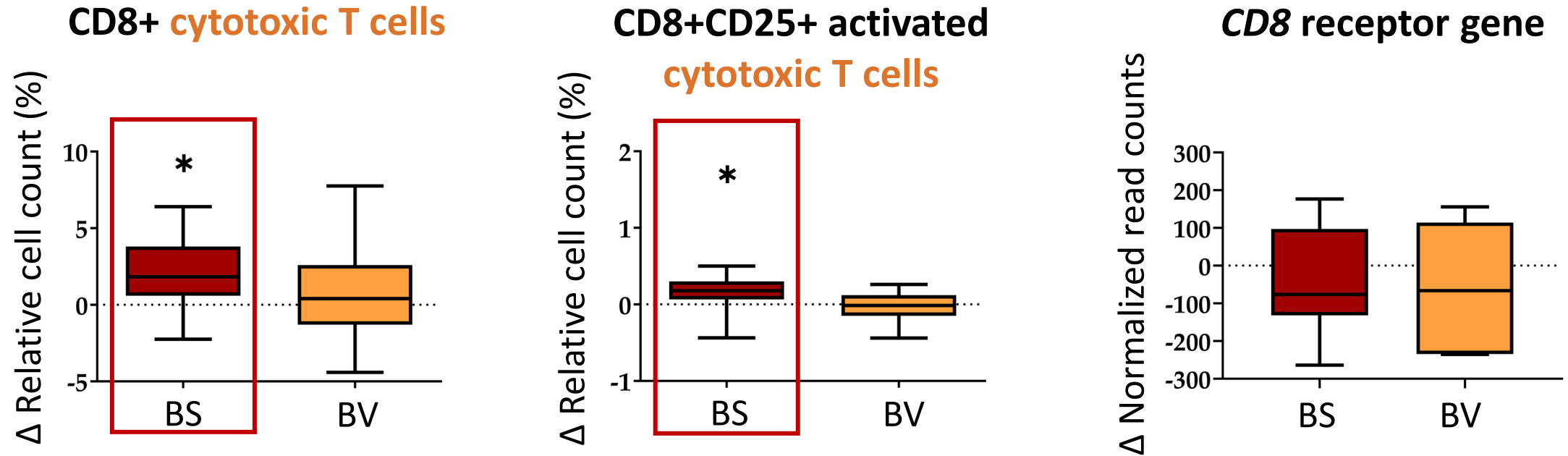




BS and **BV** did not affect the **B cell** count

***B. subtilis* (BS)**; n = 6 (FACS)

***B. velezensis* (BV)**; n = 9 (FACS)



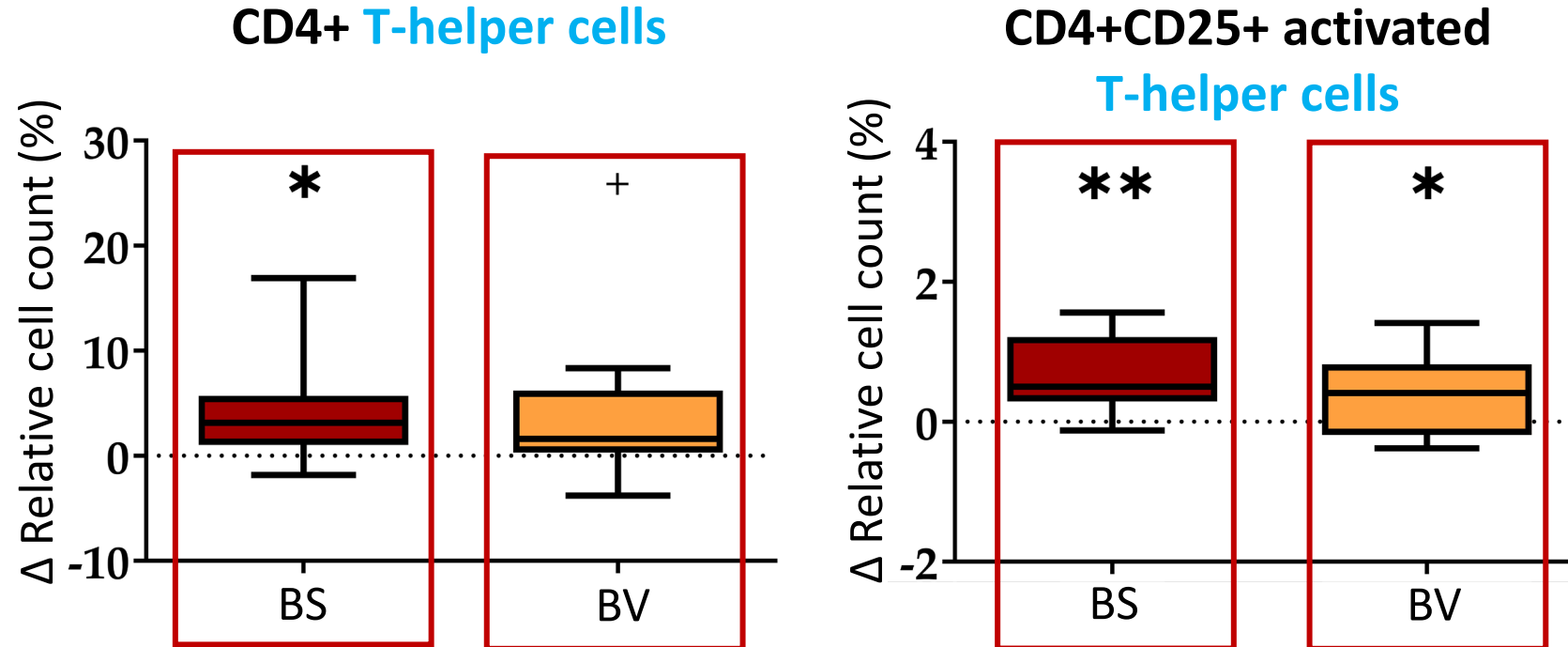
BS increased the count of **cytotoxic T cells** and **activated cytotoxic T cells**

Higher surface marker expression could not be validated by surface marker gene expression

* $p < 0.05$

***B. subtilis* (BS)**; $n = 13$ (FACS), $n = 6$ (RNA-Seq)

***B. velezensis* (BV)**; $n = 11$ (FACS), $n = 6$ (RNA-Seq)

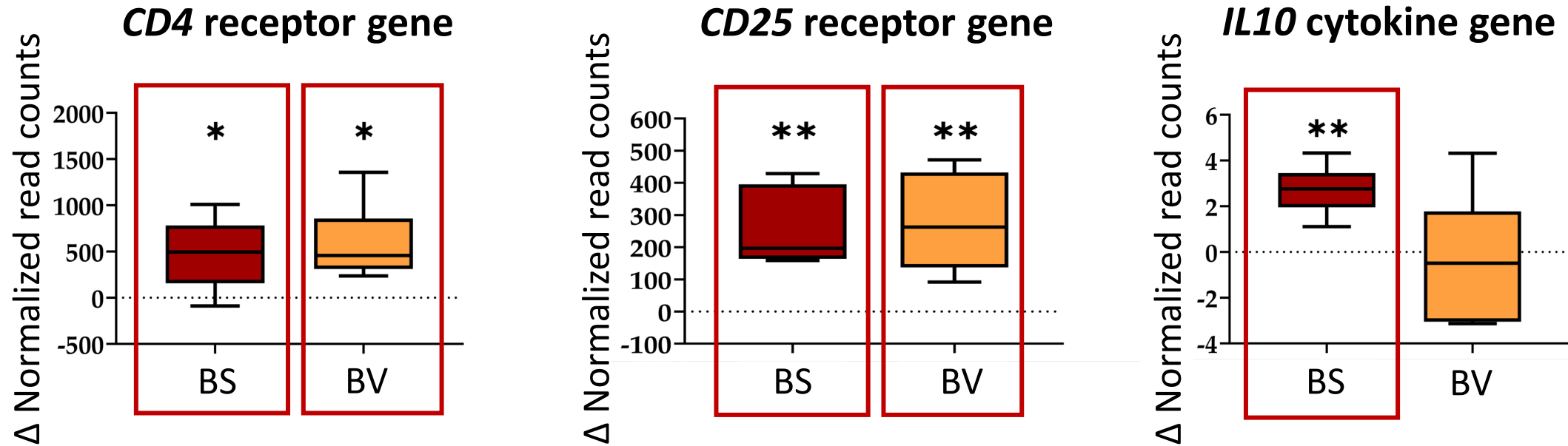


BS and **BV** elevated the count of **T-helper cells** and **activated T-helper cells**

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

***B. subtilis* (BS)**; n = 11 (FACS)

***B. velezensis* (BV)**; n = 11 (FACS)



BS increased the expression of **Treg**-associated surface marker and cytokine genes

BV elevated the expression of **T-helper cell**-associated surface marker genes

* $p < 0.05$, ** $p < 0.01$

***B. subtilis* (BS)**; n = 6 (RNA-Seq)

***B. velezensis* (BV)**; n = 6 (RNA-Seq)

- **BS** and **BV** did not affect **B cell** surface marker expression
- **BS** stimulated surface marker expression of **cytotoxic T cells**
- **BS** and **BV** stimulated surface marker and surface marker gene expression of **T-helper cells**
 - **BS** most likely stimulated **Tregs**

BS and **BV** may have positive effects on chickens health by enhancing T cell immune responses

Thank you for your attention!

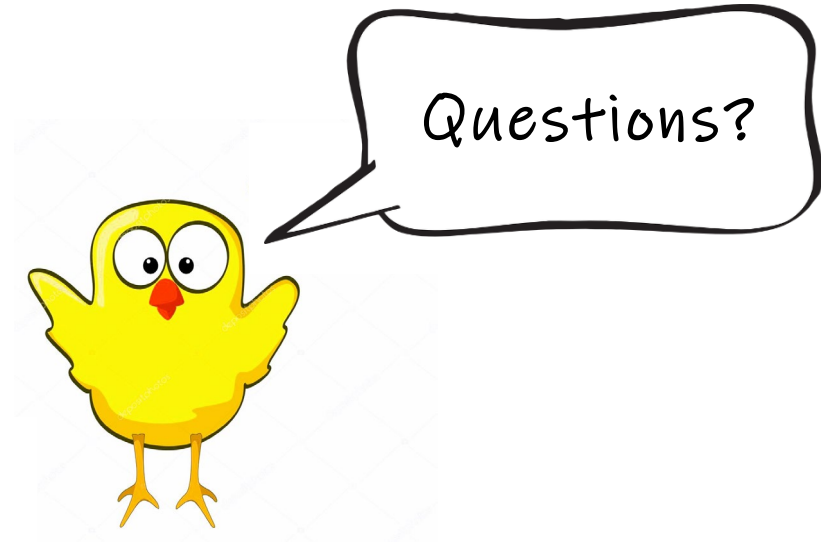


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