BYDGOSZCZ UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Investigating the impact of Sodium Butyrate on gene expression profiles in chicken intestinal organoids

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HR EXCELLENCE IN RESEARCH

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Background

Organoids

- Miniature, self-organizing 3D tissue cultures called **organoids** are derived from stem cells.
- In the right environment, these cells divide and differentiate into various cell types, forming structures that mimic real organs.

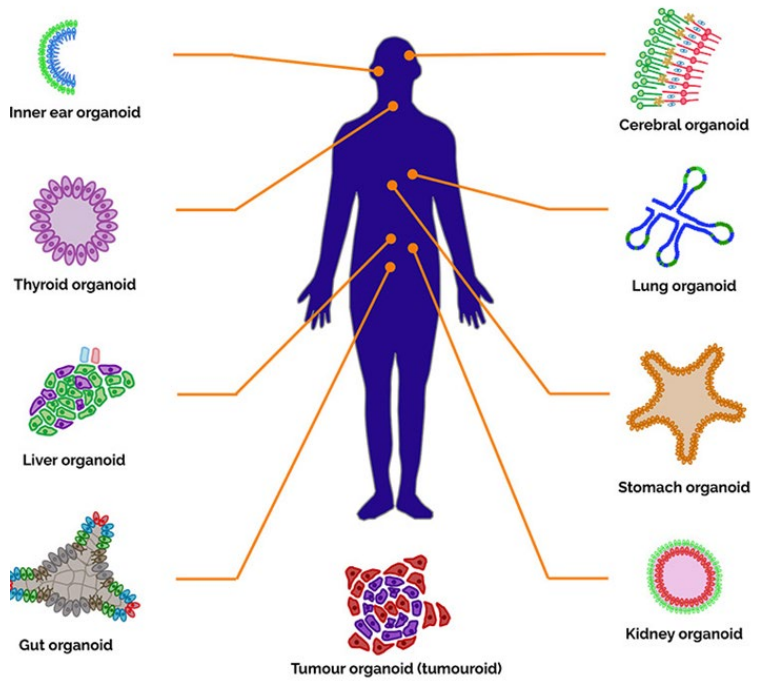


Fig. 1. Organoids from various tissues of the body.
Source: https://andor.oxinst.com/learning/view/article/organoids-providing-a-more-accurate-model-of-complex-cell-function

Background

Intestinal organoids

The source of intestinal adSCs are intestinal crypts. Isolated and placed in an appropriate culture environment, they proliferate and differentiate

<u>Essential elements include:</u>

Extracellular matrix – ECM – gel scaffold

Noggin, R-spondin,

EGF, PGE2

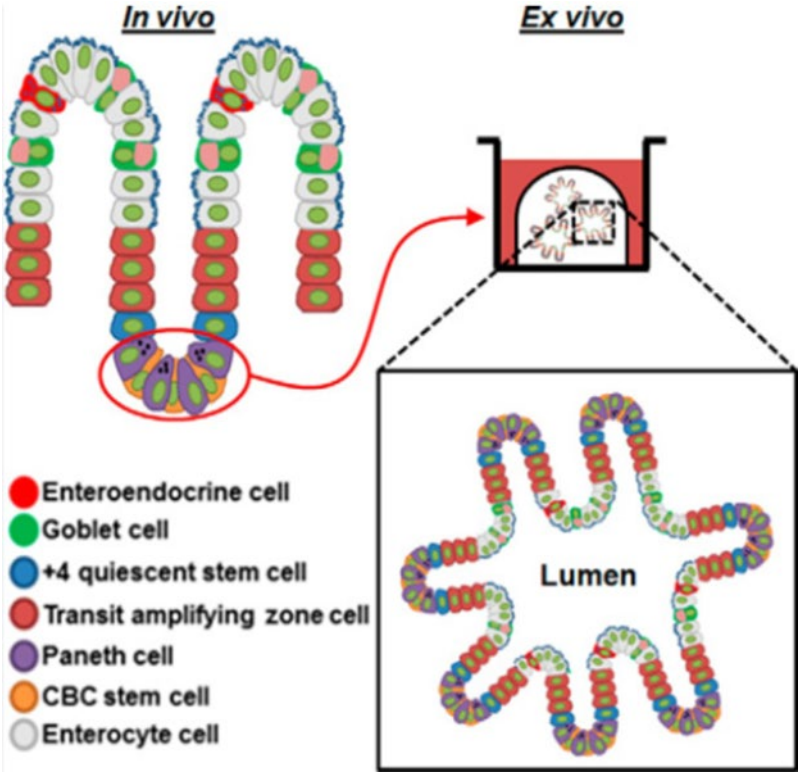


Fig. 2. Scheme of obtaining AdSCs cells to create enteroids.
Source: Tang, XY., Wu, S., Wang, D. et al. Human organoids in basic research and clinical applications. Sig Transduct Target Ther 7, 168 (2022)

Background

Organoids vs. Monolayer Cultures

- **Complexity**

Capturing cellular interactions and microenvironments absent in monolayer cultures.

- **Functionality**

Organoids replicate organ-specific functions and responses more accurately than flat, 2D cell layers.

- **Applications**

Ideal for disease modeling and drug testing, offering a more relevant and predictive in vitro model than traditional monolayer cultures.

Background

Sodium butyrate

- Administration of a biochemically available form - sodium butyrate (SB) - allows it to be converted in the host's digestive tract to the form of butyric acid;

- As one of the main short-chain fatty acids, it promotes beneficial intestinal microbiota and improves production parameters.

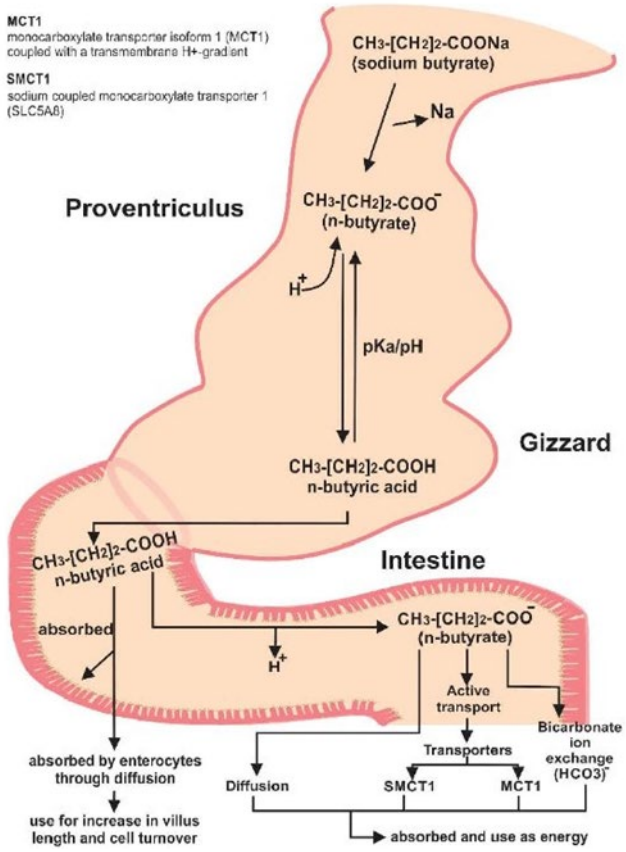


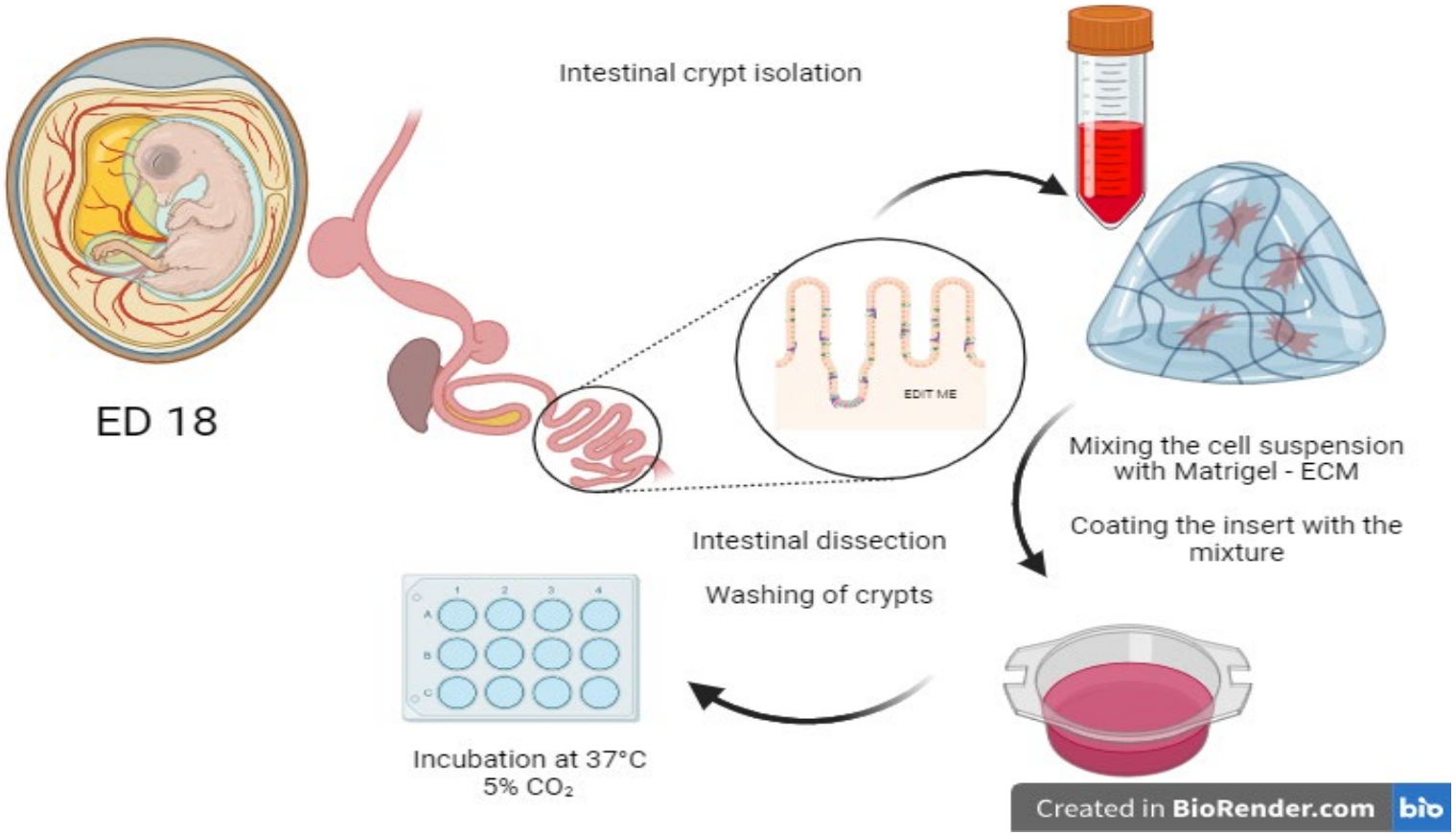
Fig. 3. Conversion of sodium butyrate to butyric acid in the chicken GIT. Ahsan U. et al., (2016). Sodium butyrate in chicken nutrition: The dynamics of performance, gut microbiota, gut morphology, and immunity. World's Poultry Science Journal, 72(2), 265-275.

Aim of study

The objective of this experiment was to culture *ex vivo* chicken intestinal organoids, stimulate them with sodium butyrate, and evaluate changes in transcript levels of genes associated with intestinal barrier function and immune response.

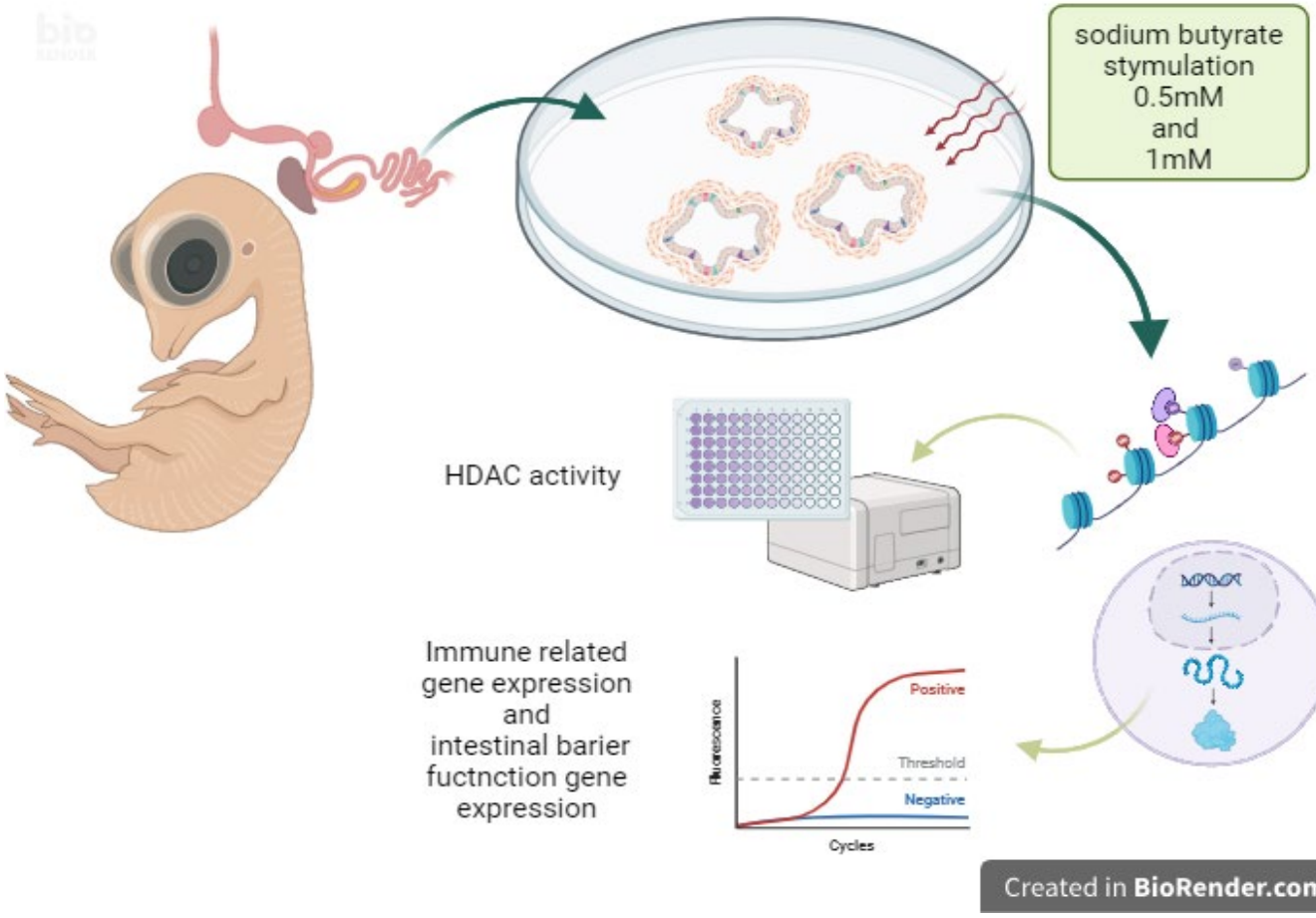
Material & Methods

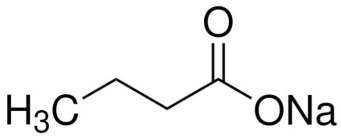
The first stage of the experiment



Material & Methods

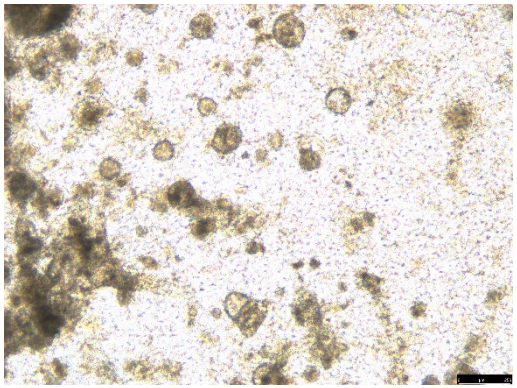
Experiment layout

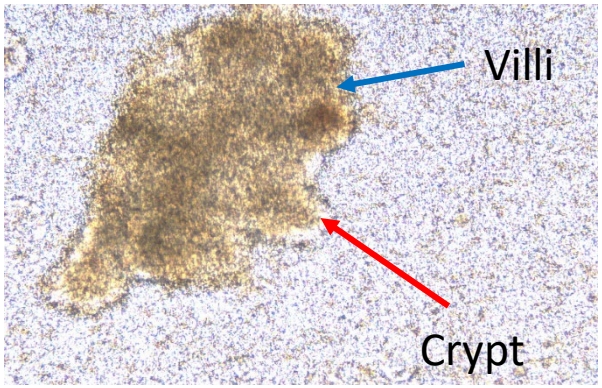




Results

Establishing of chicken enteroids



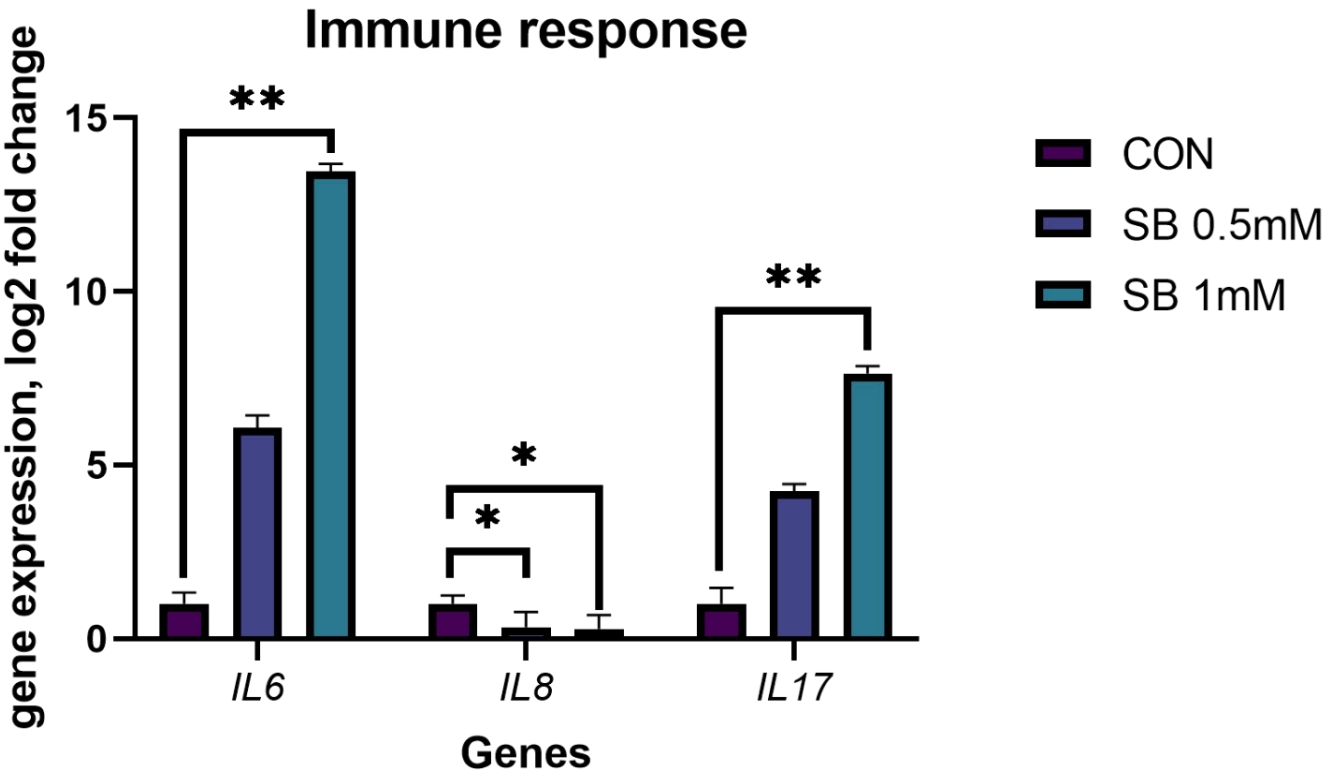


First 1-3 days

After 4-5 days

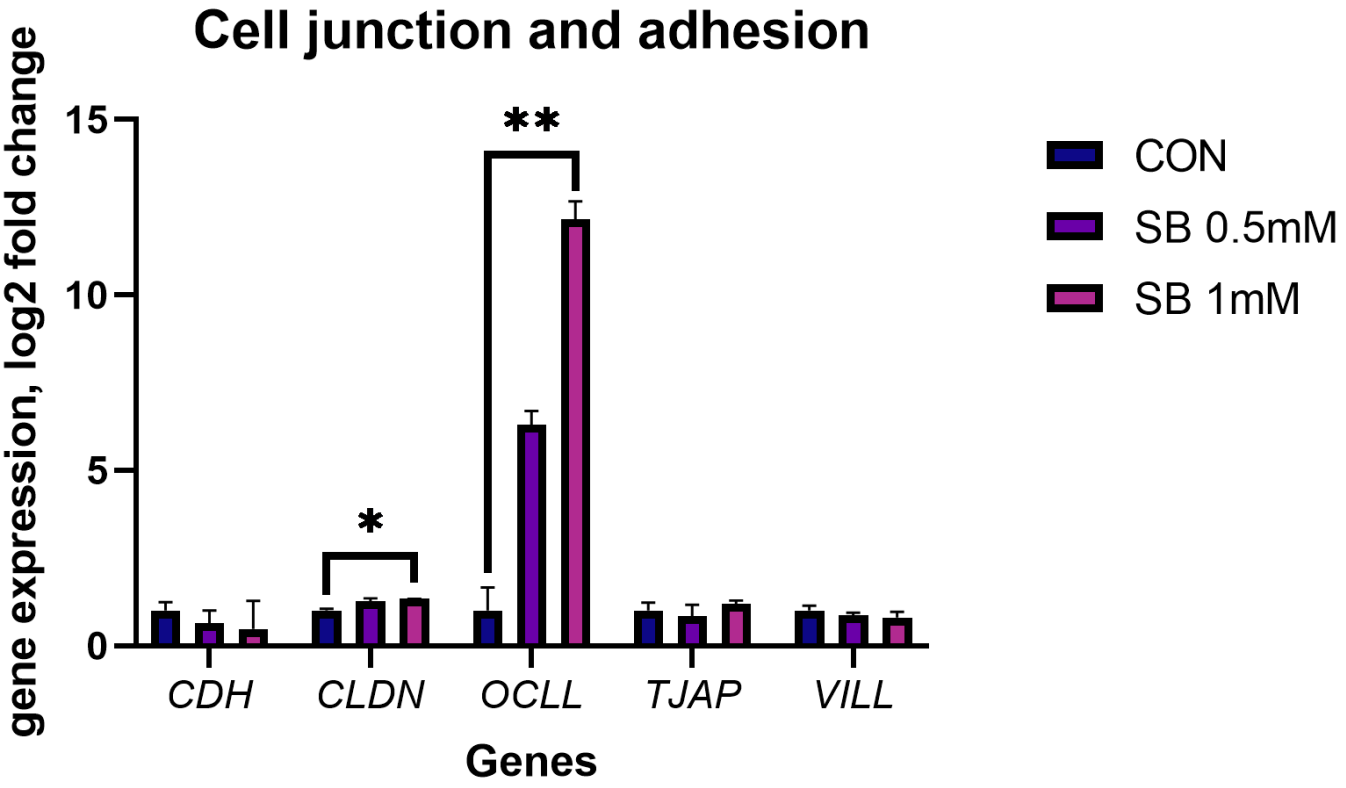
Results

Gene expression



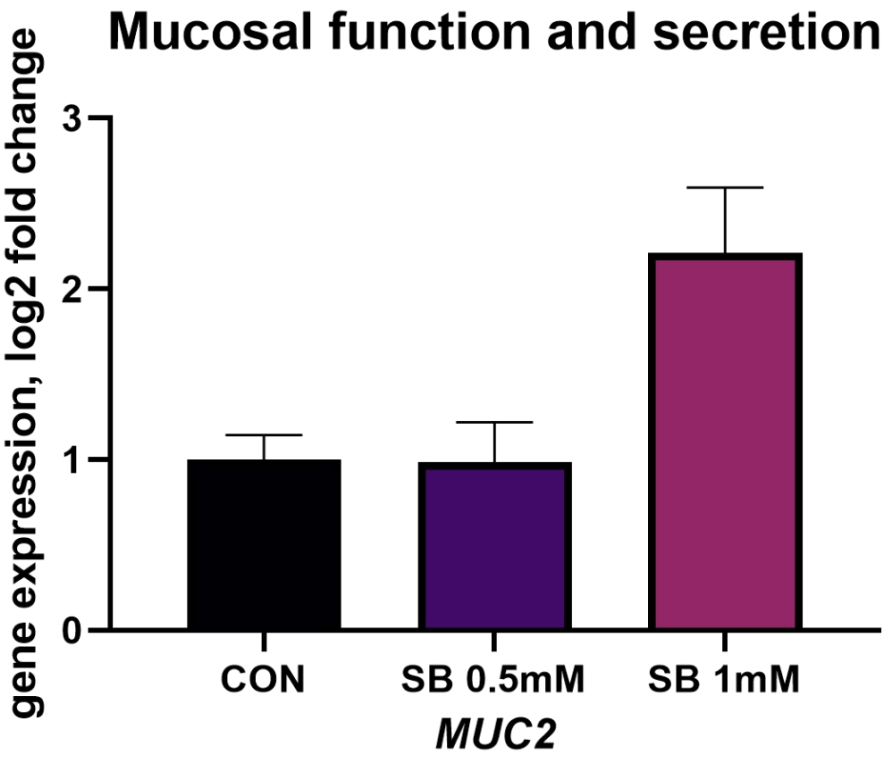
Results

Gene expression



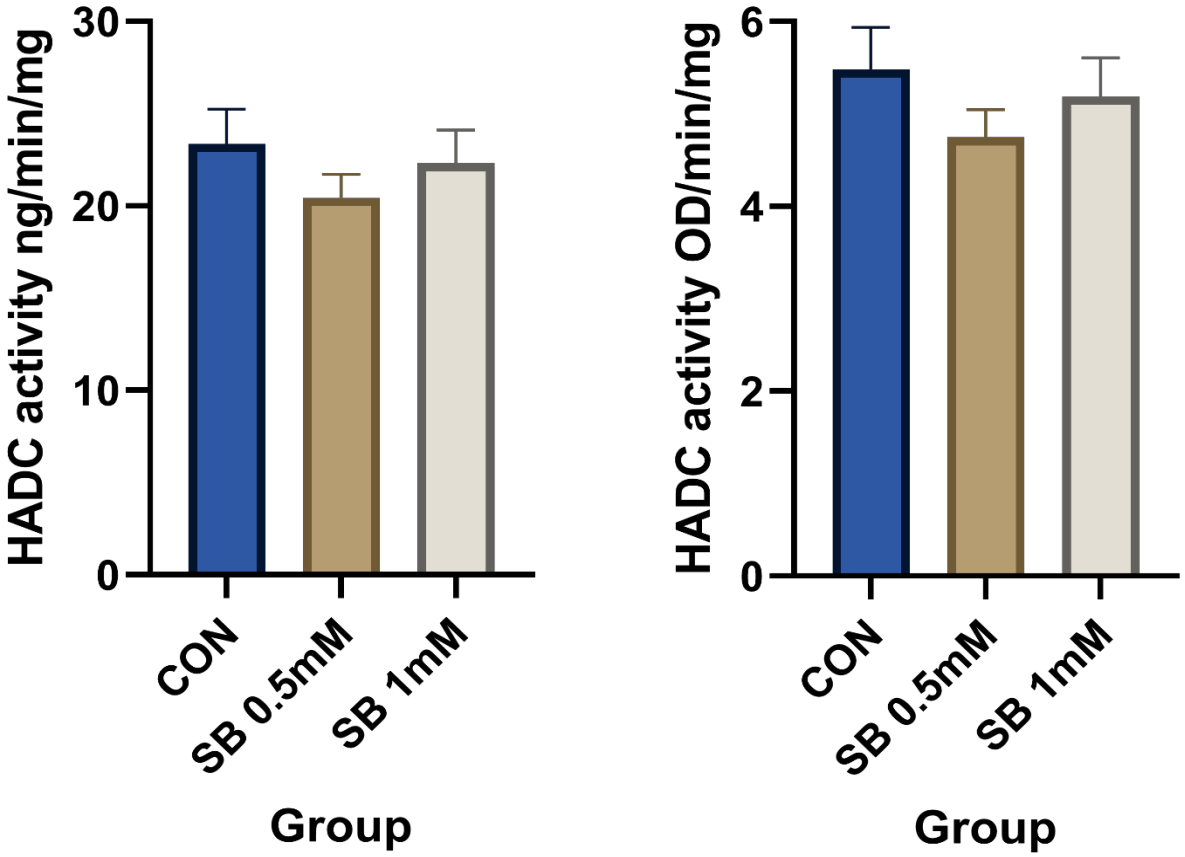
Results

Gene expression



Results

Histone deacetylase activity



Concusion

The chicken enteroid model may be an effective tool for testing the effects of postbiotics on host health

- **Inflammatory Response Modulation:**

Significant increase in pro-inflammatory cytokines *IL-6* and *IL-17*.

Decrease in *IL-8* levels suggests reduced neutrophil recruitment.

- **Barrier Function Enhancement:**

Upregulation of tight junction-related genes *OCLL* and *CLDN2*. Indicates potential strengthening of intestinal barrier integrity.

Thank you for your atention!

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