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Poster #29: Living together: molecular mechanisms of phage-bacterial coexistence in the gut

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Phages play a crucial role in maintaining gut microbiome homeostasis by regulating bacterial populations and modulating host metabolic and immune functions. Despite the remarkable stability of both bacterial and phage communities in the intestine, the mechanisms enabling their long-term coexistence remain poorly understood. This study aimed to identify the key ecological and molecular factors driving phage-bacterial coexistence in the gut environment.

To address this question, we used two well-established gut bacterial models, Escherichia coli and Enterococcus faecalis, together with three virulent phages infecting each species. Long-term in vitro coexistence assays were performed under different environmental conditions, including the presence of the defined microbial community Oligo-Mouse-Microbiota (OMM12). In parallel, comparative proteomic analyses were conducted to characterize bacterial responses associated with phage coexistence.

Long-term coexistence was observed for most phage-host pairs, with the presence of a microbial community enhancing phage persistence. Proteomic analyses revealed the upregulation of pathways involved in nutrient uptake and metabolism, particularly the transport and utilization of simple carbohydrates, suggesting that metabolic adaptation is a key mechanism supporting coexistence. In addition, some bacterial defense systems were differentially regulated, indicating a potential role in phage-bacterial coexistence. Ongoing validation using targeted knockout mutants is further supporting the contribution of these pathways to stable phage-host interactions.

Overall, this work provides new insights into the molecular and ecological mechanisms governing phage-bacterial coexistence in the gut and identifies potential targets for microbiome-based therapeutic strategies.

Reference #1

Reference #2

Reference #3

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