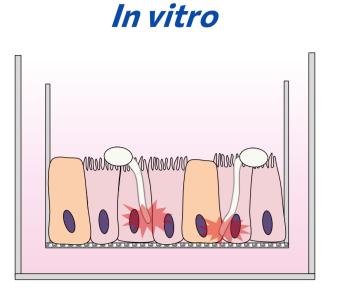
Image-based analysis of *Candida albicans* infection in a gut-on-chip model

Parastoo Akbarimoghaddam^{1,2,3}, Raquel Alonso-Roman^{1,4}, Manuel Allwang⁵, Tim Kaden^{3,6}, Marisa Valentine^{1,4}, Katja Graf⁶, Bianca Hoffmann², Zoltan Cseresnyes², Bernhard Hube^{1,4,7}, Alexander S. Mosig^{1,5,8}, Mark S. Gresnigt^{1,9}, Marc Thilo Figge^{1,2,7}

- ¹ Cluster of Excellence Balance of the Microverse, Friedrich Schiller University Jena, Jena, Germany
- ² Applied Systems Biology, Leibniz Institute for Natural Product Research and Infection Biology Hans Knöll Institute, Jena, Germany
- ³ Friedrich Schiller University Jena, Jena, Germany
- ⁴ Department of Microbial Pathogenicity Mechanisms, Leibniz Institute for Natural Product Research and Infection Biology Hans Knöll Institute, Jena, Germany
- ⁵ Institute of Biochemistry II, Jena University Hospital, Jena, Germany
- ⁶ Dynamic 42 GmbH, Jena, Germany
- ⁷ Institute of Microbiology, Faculty of Biological sciences, Friedrich Schiller University Jena, Germany
- ⁸ Center for Sepsis, Control and Care, Jena University Hospital, Friedrich-Schiller-University of Jena, Germany
- ⁹ Junior Research Group Adaptive Pathogenicity Strategies, Leibniz Institute for Natural Product Research and Infection Biology Hans Knöll Institute, Jena, Germany

In vivo

Candida albicans: commensal and pathogen

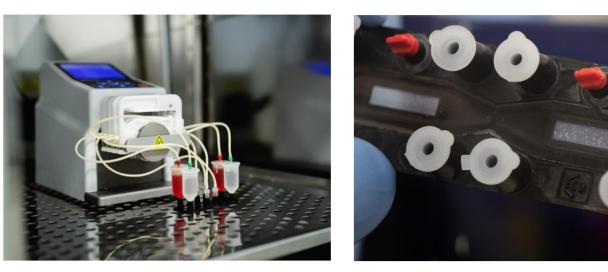


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Pathogen

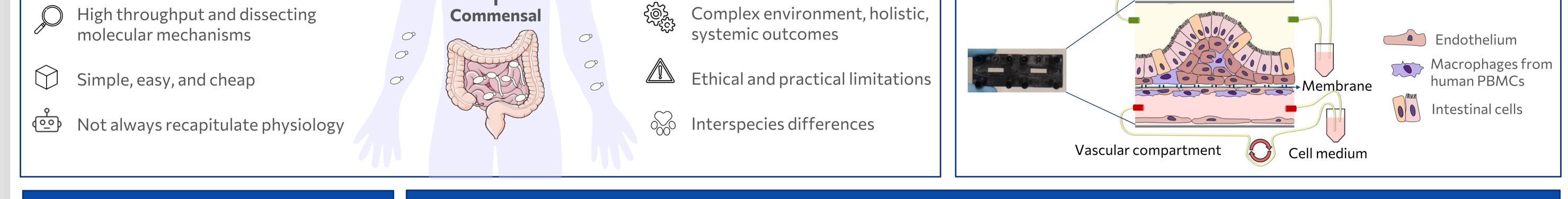
Gut-on-chip experimental model



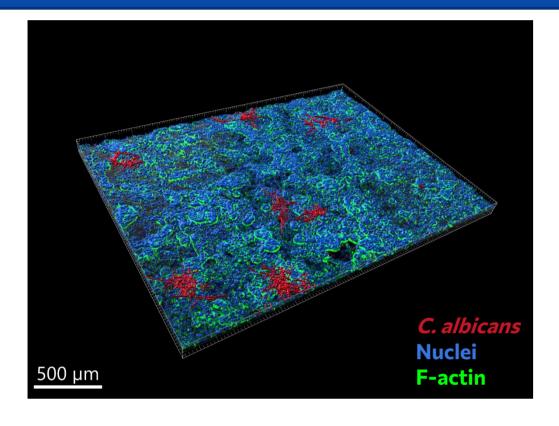
- Multicellularity
- Immune cells
- Tissue architecture
- Compartimentalization
- Dynamic system
- Human cells
- Imaging

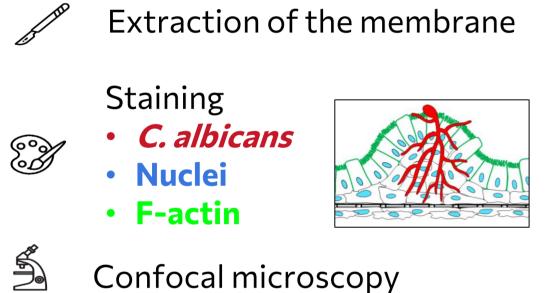
Near-physiological

Epithelial compartment



Data generation





Morphometrics of microcolonies

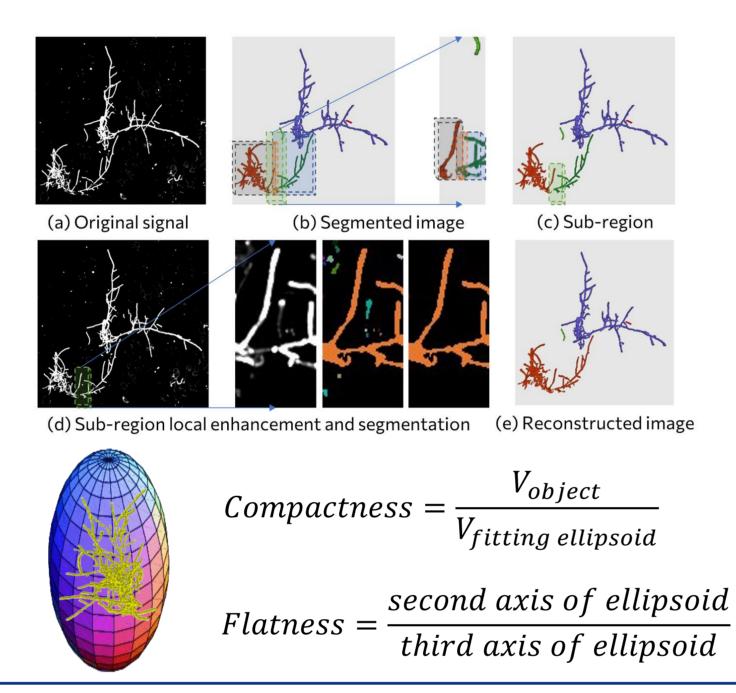
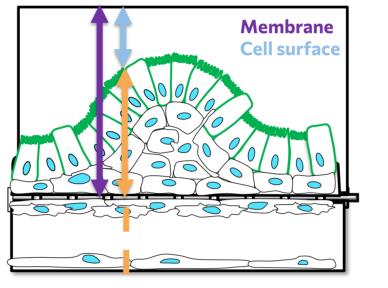
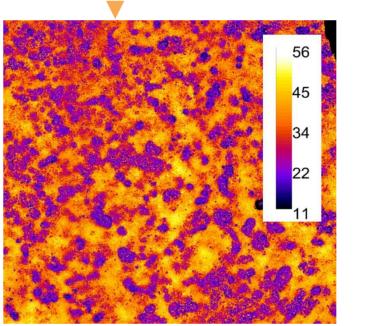


Image analysis pipeline

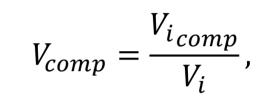
Quantification of tissue architecture



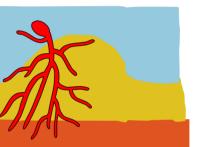
Tissue thickness



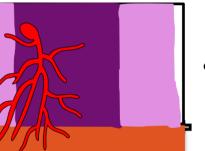
Spatial host-fungus interaction



comp: one of the three compartments $V_{i_{comp}}$: the proportional overlapping volume of microcolony *i* with *comp V_i*: overall volume of microcolony *i*



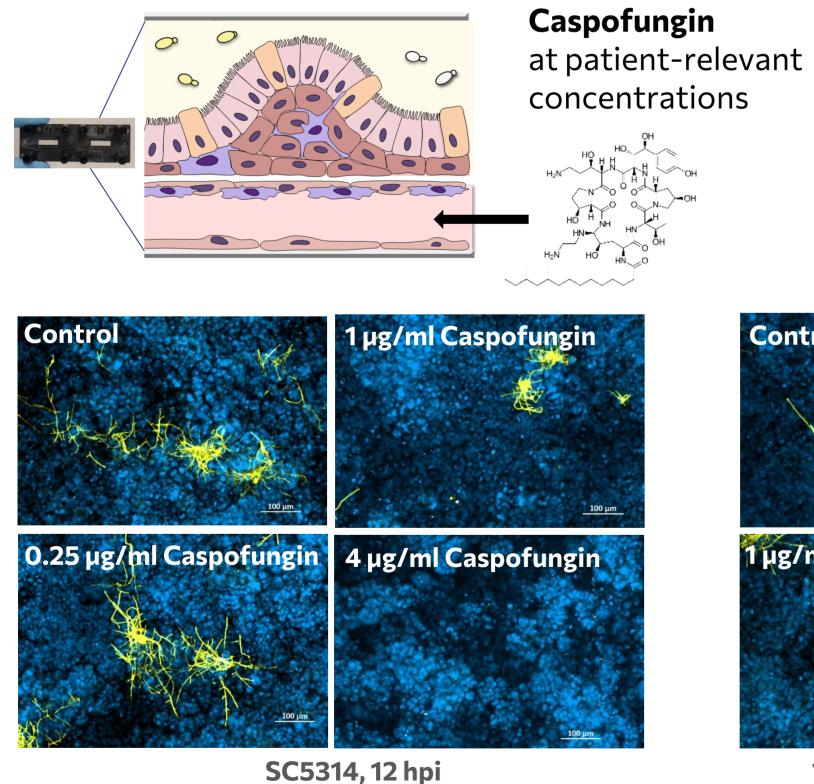
• Quantification of epithelial tissue penetration and vascular invasion



Localization of microcolonies on epithelial tissue landscape

Application I: Caspofungin effect on *C. albicans* infection in a gut-on-chip model

Experimental setup



4 µg/ml Caspofungin Control 1µg/ml Caspofungin 6 µg/ml Caspofungin 110.12 (echinocandin-resistant), 12 hpi

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SC5314

110.12: clinical isolate,

resistant to echinocandins

C. albicans

Nuclei

Clinical isolate 110.12

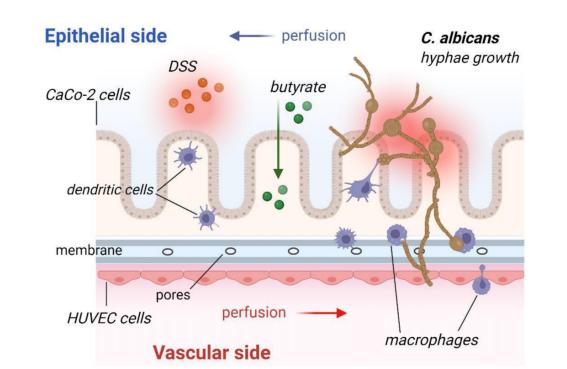


Application II: Quantitative assessment of the preventive effect of butyrate in an inflammatory-bowel-disease-on-chip model

Inflammatory bowel disease (IBD)

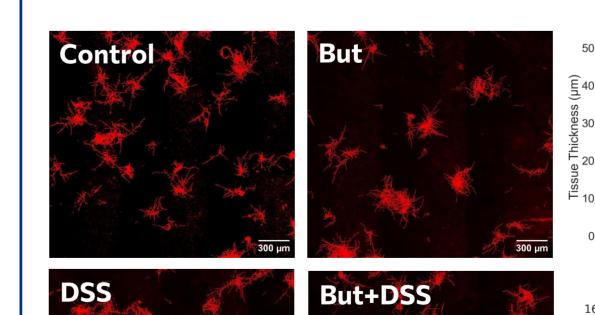
- Chronic inflammation of the gastrointestinal (GI) tract
- Severe and rising healthcare issue in the world, especially in industrialized countries

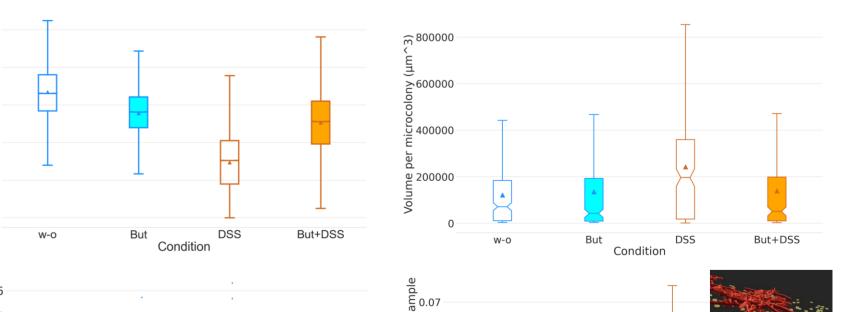
Experimental setup

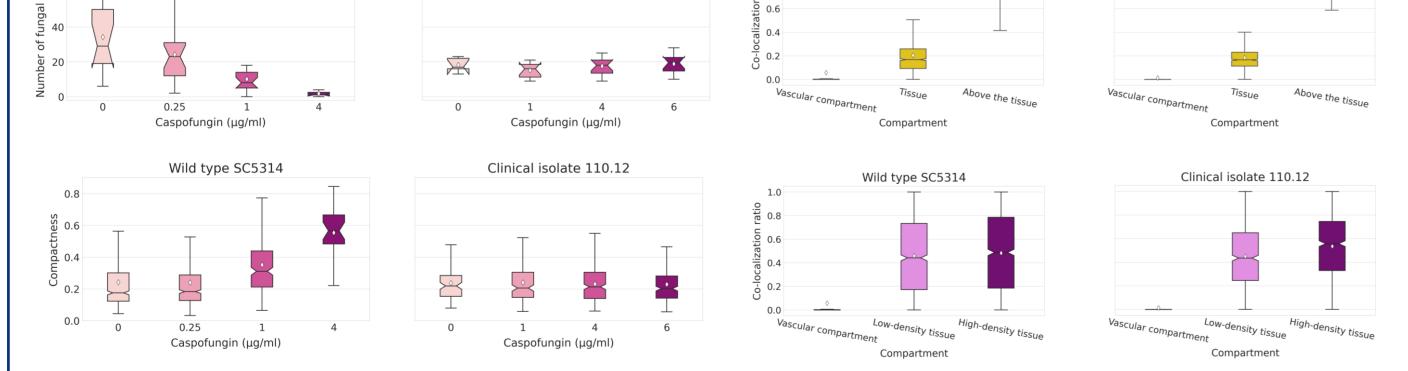


Gut-on-chip has been developed to a disease-model mimicking IBD using dextran sodium sulfat (DSS)

- ✓ Reduced expression of E-Cadherin
- ✓ Elevated levels of proinflammatory cytokines such as IL-6 and IL-8









✓ Preventive effect of butyrate on the tissue damage caused by DSS ✓ Increased flatness in microcolonies under DSS ✓ Reduced fungal volume and invasion after pretreatment with butyrate

Parastoo.Akbarimoghaddam@leibniz-hki.de

www.leibniz-hki.de

References

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- ² X.C. Morgan *et al.* 2012. *Genome biology*. 13: 1-18
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- ⁴ M. Maurer *et al.* 2019. *Biomaterials.* 220: 119396
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- ⁷Deleu *et al.* 2021. *EBioMedicine*. 66
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