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# MiCoBion

**Microbial Communities in Biomedical and Environmental Areas, and Systems Biology**

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### **Report from Conference on Microbial Communities: Function, Structure and Complexity**

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## Executive Summary

This document provides a summary of a task within Work Package WP4 *Workshops and conferences*, namely: T4.8 *Conference on Microbial Communities: Function, Structure and Complexity* led by the Charles University (CUNI). It contains description of the content of the project closing conference, presents details about the agenda and events' participants, and provides details about the outcomes and benefits brought to CUNI.

Compared to the plan of having a four-day event, the conference lasted three days. However, the intended impact of the activity was well achieved.

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## 1. Introduction

Deliverable D4.7 *Report from Conference on Microbial Communities: Function, Structure and Complexity* is associated with task T4.8 *Conference on Microbial Communities: Function, Structure and Complexity*. The objective of this task is to summarize achieved results of the twinning activities and results of collaborative research that was boosted by the twinning activities. The conference took place on 2 – 4 November 2022, at BIOCEV as a three-day event and was attended by over 120 participants from CUNI, external speakers and industry.

## 2. Conference Participants

The conference was organized into five sessions: (1) Protists and Parasites, (2) Integrated Multiomics Analysis, (3) Methods, (4) Virology, and (5) Yeast. For each session we invited at least two highly recognized experts in the field from partner institutions – the Catholic University of Leuven (KUL) - Daan Jansen; Johan Thevelein, the European Molecular Biology Laboratory (EMBL) - Michael Zimmermann, Carlos Voogdt, Robert Finn, the University of Paris (UP) - Sebastien Leon, Jean-Michel Camadro, other universities from four countries in Europe and North America:

- Robert Burk, Albert Einstein College of Medicine, NYC, USA;
- Robert Hirt, Newcastle University, UK;
- Luigi Fiori, The University of Sassari, Italy;
- Colin Bingle, The University of Sheffield, UK;
- Laura Wegener Parfrey, University of British Columbia, Canada

and industry:

- Adam King, Waters Corporation, UK.

For each session we selected two or more speakers from BIOCEV laboratories, who were involved in MiCoBion project to present results associated with the MiCoBion activities. Altogether, eleven local speakers were selected (see programme below).

Altogether, over 120 participants were registered, and were either personally present or participated online as the whole conference was streamed to be accessible for those who were unable to come to the BIOCEV centre. Most participants were from Charles University (Faculty of Science, First Medical Faculty), but also from Institute of Microbiology, Biotechnology, and Molecular Genetics of Czech Academy of Science, and industry (Biopharm s.r.o., Waters Corporation).



### 3. Conference Content

The conference was focused on the latest achievements in analyses of microbial communities and various aspects of microbial interactions within specific environments, e.g. interplay of parasitic protists with vaginal bacteria and host cells, the role of microbiota in respiratory tracts, effect of environmental factors on intestinal viromes, interactions between cells inside of yeast colonies, etc. As MiCoBion project was focused also on promotion of knowledge and implementing cutting edge multiomics technologies, the conference included a section “Methods” chaired by Vladimír Beneš that was focused on methodological innovations associated with modern approaches of microbiome analyses and big data interpretation and visualization.

#### Program of the conference:

##### **Protists and Parasites**

Chair: Jan Tachezy / MICOBION Project Coordinator

09:00 Welcome Address by Jan Tachezy and Agne Dobranskyte-Niskota (Research Executive Agency, European Commission)



09:10 The strange case of Dr. Jekyll and Mr. Hyde: how endosymbionts may influence the pathophysiology of *Trichomonas vaginalis*

Luigi P. Fiori / The University of Sassari, Italy

09:50 Comparative genomics and transcriptomics of *Trichomonas*: new insights into parasite-microbiota interactions

Robert Hirt / Newcastle University, UK

10:30 - 10:45 Coffee Break - Foyer at the Conference Hall

10:45 *Trichomonas vaginalis* interactions with the vaginal microbiome

Nadine Zimmann and Jan Tachezy / Faculty of Science, Charles University

11:05 Metabolic interactions between *Monocercomonoides exilis* and its bacterial community

Vladimír Hampl / Head of Laboratory, Faculty of Science, Charles University (BIOCEV)

11:25 Function and biogenesis of pathogen specific organelles in *Giardia intestinalis*

Pavel Doležal / Head of Laboratory, Faculty of Science, Charles University (BIOCEV)

11:45 - 13:00 Lunch

## Integrated multiomics analyses

Chair: Pavel Stopka / Head of Laboratory, Faculty of Science, Charles University (BIOCEV)

13:00 Introduction by Pavel Stopka



## MiCoBion

- 13:10 Cell type specific infection in the respiratory tract  
Colin Bingle / Professor of Respiratory Cell and Molecular Biology, The University of Sheffield, UK
- 14:00 Can we use ecology to predict function in the microbiome?  
Laura Wegener Parfrey / Assistant Professor, Department of Botany, University of British Columbia, Canada
- 14:50 Dynamics of vaginal microbiota during mouse estrus  
Romana Stopková / Faculty of Science, Charles University (BIOCEV)
- 15:05 Orthohantaviruses in reservoir and spillover hosts  
Jana Kvičerová / Department of Parasitology, Faculty of Science, University of South Bohemia in České Budějovice
- 15:20 Closing remarks

**Methods**

Chair: Vladimír Beneš / Head of Genomics Core Facility, EMBL - Heidelberg

09:00 Introduction by Vladimír Beneš



- 09:05 Identify microbiota contributions to xenobiotic metabolism and toxicity  
Michael Zimmermann / EMBL
- 09:50 The Simple Light Isotope Metabolic Labeling strategy (SLIM-L), a new and powerful approach to address the dynamics of proteome variations at the intact protein level  
Jean-Michel Camadro / Université Paris Diderot, Institut Jacques Monod General
- 10:35 - 10:55 Coffee Break - Foyer at the Conference Hall
- 10:55 Developing new model organisms for the human microbiome  
Carlos Voogdt / Postdoctoral Fellow (EIPOD), EMBL
- 11:30 Identifying the site of metabolite conjugation using cyclic ion mobility"  
Adam King / Waters Corporation
- 12:00 - 13:15 Lunch



## Virology

Chair: Ruth Tachezy / Head of Laboratory, Faculty of Science, Charles University (BIOCEV)

13:15 Introduction by Ruth Tachezy



13:20 Cervicovaginal microbiome and host response influence HPV infection and disease outcomes

Robert Burk / Professor and Vice Chair, Albert Einstein College of Medicine, NYC, US

14:05 Community Types Of The Human Gut Virome Are Associated With Endoscopic Outcome In Ulcerative Colitis

Daan Jansen / Rega Institute, Laboratory of Viral Metagenomics, KU Leuven

14:50 - 15:05 Coffee Break - Foyer at the Conference Hall

15:05 Human gut viromes and the exposomic investigations in type 1 diabetes and celiac disease

Ondřej Cinek / Department of Paediatrics, Second Faculty of Medicine, Charles University

15:30 Analysis of aspartate b-hydroxylase signaling by transcriptomics

Shweta Dilip Johari / Faculty of Science, Charles University (BIOCEV)

15:55 Virome of bees

Dominika Kadlečková / Faculty of Science, Charles University (BIOCEV)

### Special lecture

16:05 Genome resolved metagenomics analysis for understanding the composition of the human gut microbiome

Robert Finn / Team Leader, Microbiome Informatics team, EMBL's European Bioinformatics Institute

16:25 Closing remark

## Yeast

Chair: Zdena Palková / Head of Laboratory, Faculty of Science, Charles University (BIOCEV)

09:00 Introduction by Zdena Palková



09:05 Novel Warbicin® family of phosphorylation-dependent glucose-uptake inhibitors in yeast and human cells as potential anti-cancer drugs

Johan Thevelein / Managing Director, NovelYeast

09:50 Genetic basis of 2-deoxyglucose resistance in yeast

Sebastien Leon / Group Leader, Institut Jacques Monod

10:35 - 11:00 Coffee Break - Foyer at the Conference Hall

11:00 Metabolic differentiation of invasive and surface cells of yeast colony biofilms.

Jana Maršiková / Faculty of Science, Charles University (BIOCEV)

11:20 GA new insight into the mitochondrial retrograde pathway and its role in yeast colony development

Vítězslav Plocek / Faculty of Science, Charles University (BIOCEV)

11:40 Genome-wide approaches to studying yeast populations

Michal Čáp / Faculty of Science, Charles University (BIOCEV)

12:00 Closing Remark

## 4. Conference Outcomes

The professional level of all speakers was very high and not surprisingly, the conference was highly appreciated by all speakers and audience. The conference was very inspiring and increased our knowledge concerning research field of microbial communities, but also methodological innovations. Most importantly, it provides valuable platform for networking, time for discussions after each lecture but also during business lunches. One of the best lectures was given by Michael Zimmermann who showed a data concerning metabolism of various xenobiotics by intestinal microbiota. Microbial metabolism for example may decrease an efficiency of drugs against pathogens and result in the refractory treatment, or produce carcinogens that trigger carcinogenesis. Robert Finn provided overview of new bioinformatic tools for analysis of mixed metagenomic data containing both viral (DNA, RNA viruses) and host contigs such as VirFinder, and VirSorter, and also for proteomic data and protein structure prediction (e.g. AlphaFold). Jean-Michel Camadro introduced new methods for quantitative proteomics of intact proteins using simple light isotope metabolic labelling (SLIM).

The direct output of networking was, for example, an agreement on collaboration between laboratories at Charles University, University of Sassari and Newcastle University on investigations of interaction between

anaerobic protists and microbiota in oral cavity and genitourinary tract. This future collaboration is now proposed in research project proposal "Pathogens and Parasites from the One Health Perspective" in frame of Programme Johannes Amos Comenius with ERDF support. Another important outcome was an informal discussion on programme HERA2 (Health Emergency preparedness and Response Authority, Horizon Europe) that will be funded since 2013 with participation of MiCoBion laboratories at Charles University and KUL. Multiple possibilities for other joint experiments/projects were discussed such as testing of new inhibitor of glucose transport WarbicinA that was introduced by Johan Thevelein, against various pathogenic protists, or joint genome sequencing of oral eukaryotic pathogens.

## 5. Conclusions

Altogether, the conference was very successful, and fulfils all expected aims, which include gaining of new knowledge via invited experts from academic institutions and industry, reviewing collaborative experiments performed in frame of MiCoBion project in each area of associated research (microbiomes, viromes, interactions with parasite and host environments), and discussions concerning extension of current collaboration as well as establishment of new directions.



## **6. Degree of Progress**

The deliverable is 100% fulfilled.

## **7. Dissemination Level**

The Deliverable D4.7 is a public deliverable.