

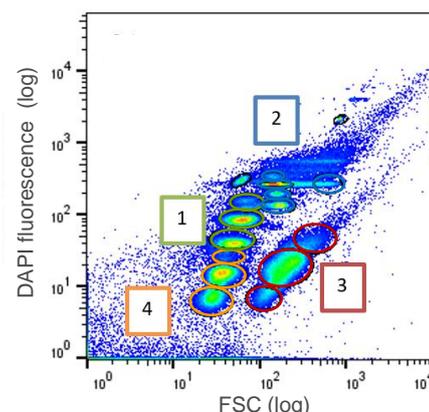
Microbial cytometric mock community – a new standard for microbiome analyses

Background:

Flow cytometry core facilities are places of cutting-edge research that routinely perform high-throughput screening of cell populations and sorting of rare cells for downstream analyses. With the immense importance of the human microbiome recognised and the fields of microbial biotechnology and ecology established and growing, microbial flow cytometry becomes ever more important.

Challenge:

Inaccurate sample preparation, different cytometer configuration and the small size of bacterial cells can cause variability at the single-cell level. Therefore, each measurement session requires prior calibration. However, classical alignment beads, widely used to date, only cover cytometer calibration and cannot detect errors in the sample handling, staining and preparation workflow.



1: *E. coli*, 2: *P. polymyxa*, 3: *K. rhizophila*, 4: *S. rhizophila*, Classic beads

UFZ Know-how:

- High-throughput multi-parameter flow cytometry
- Microbial communities in industrial processes
- Bioinformatic tools

UFZ Expert: Prof. Dr. Susann Müller
(Head of Working Group Flow Cytometry)

Protocol & detailed information:

[1]: Bacterial mock communities as standards for reproducible cytometric microbiome analysis, *Nature Protoc.* 2020: 2788-2812

IP status:

PCT patent application
(WO2020/108757, filed 11/2018)

Patent owner:

UFZ and DSMZ (German Collection of Microorganisms and Cell Cultures GmbH)

We are looking for:

Distribution partner for health sector

Innovation:

The microbial cytometric mock community consists of 3 to 4 non-pathogenic pure strains which form segregated clusters in a forward scatter (FSC) vs. nucleic acid stain dot plot. This well-defined pattern allows for reproducible cytometric microbiome analyses with validated lab workflows, generating data which is comparable between experiments [1]. Thus, the mCMC represents a novel reference standard for microbial cytometry - similar to the established mock communities for sequencing.

Benefits of the microbial cytometric mock community (mCMC)

Tasks to be solved	Beads	New: mCMC
Calibrate optic and fluidic systems on any cytometer	x	x
Adjust position and resolution range of bacteria in all commercially available flow cytometers (i.e. improve resolution and diminish background noise)	-	x
Detect operator-dependent errors or variations in cell treatment (e.g., by sampling, fixation and staining)	-	x
Compare data from devices in different laboratories	-	x
Stable cytometric data over a timeframe of days up to years (facilitates automatic bioinformatics evaluation)	-	x
Test community for cell sorting, downstream analysis and new bioinformatics tools	-	x

Areas of application:

- **Health sector:** Routine diagnostics of the human microbiomes in core facilities and hospitals
- **Biotechnology:** Monitoring and control of productive microbial communities (for example in wastewater treatment or for the production of green chemicals/hydrogen)
- **Ecology:** Investigating dynamics and evolution of natural and artificial microbiomes

Developmental status:

The mCMC can be prepared and used according to [1]. Currently, a ready-to-use kit is developed to further simplify the routine application.

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