

System for the discovery and miniaturized bioprocess development of novel natural products

The HKI is successfully developing microfluidic systems for the cultivation of microorganisms as compound producers in isolated droplets. Microorganisms from extremely complex natural habitats, such as soil samples, are separated in droplets of few picolitres and cultivated as single cells. Each droplet forms an individual microreactor and thus guarantees that the high biological diversity of the sample remains intact and fast growing microbes don't eliminate slow growing ones - as it often occurs during conventional cultivation procedures. Methods to technologically link microfluidics and large volume fermentations urgently need to be developed. For example, methods to securely and successfully transfer positive producers of antibiotics from the microfluidic chip to the fermenter and thus allow the purification and biochemical characterization of the novel compound are missing ("**Chip-to-World**" Technologies).

The project Chip-to-World aims to establish a microbioreactor system based on standardised microtiter plates in order to close this gap between microfluidic chip and fermenter. A microbioreactor system offers the possibility to screen strains and media in parallel in a miniaturized scale while at the same time optimizing the main process parameters. An integrated aeration system enables the control of the oxygen input so that cultivation of anaerob microorganisms is also possible. The combination with the associated peripheral equipment (microplate reader, chromatography system, metabolomics software) makes it possible to identify novel bioactive molecules on a small scale and in a highly parallelized manner. This equipment therefore ideally bridges microfluidics and classical fermentation and thus enables the step from chip to the world as described above.