

# BIOANALYTICS & BIO-ENGINEERING



Animal  
health



Environ-  
ment



Health-  
care

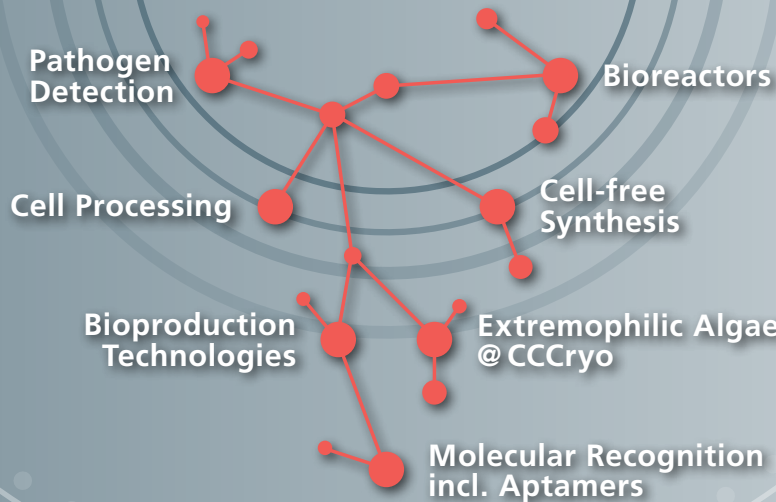
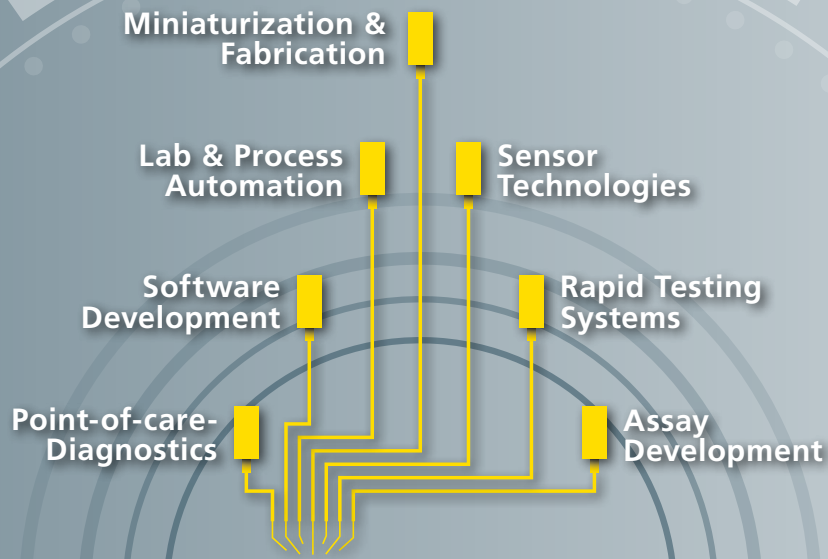


Nutrition



Cosmetics

# BIOANALYTICS & BIO-ENGINEERING



## ANALYTIC

Optimization of your analysis processes – from sample preparation and the selection of the suitable analytical methods up to data acquisition and interpretation of results.

## ASSAY DEVELOPMENT

Assay development and adaptation throughout the entire bandwidth according to your requirements – from stability tests to immunoassays.

## BIOPRODUCTION

Optimized production of complex biomolecules – from proteinogenic active substances for vaccines and antibody development to enzymes, complex peptides, proteins and synthetic biomolecules.

## CRYOPHILIC MICROALGAE FOR INDUSTRIAL USE

Screening for customer-specific ingredients in algae isolates for special applications and development of production processes.

## AUTOMATION AND MINIATURIZATION

Tailor-made solutions for your complex laboratory automation tasks in the entire field of biotechnology – increase the efficiency and quality of your processes.

## FUNCTIONAL SURFACES

We improve the biocompatibility of synthetic surfaces with layers of polyelectrolytes, polymers and biomolecules for your cell culture applications or analytical assays.

DNA | RNA

MICROSCOPY

PEPTIDES |  
PROTEINS

APTAMERS

MICRO-  
FLUIDIC |  
LAB-ON-A-CHIP

Software  
Development

Rapid Testing  
Systems

MICROARRAY

Point-of-care-  
Diagnostics

Assay  
Development

SWAB TEST |  
PCR ASSAY

ELISA |  
LATERAL  
FLOW

## CRYOPHILIC MICROALGAE FOR INDUSTRIAL USE

Screening for customer-specific ingredients in algae isolates for special applications and development of production processes.

SWAB TEST |  
PCR ASSAY

ANTIBODIES

ADDITIVE  
MANU-  
FACTURING

PROTOTYPES

Pathogen  
Detection

Bioreactors

BIO-  
COMPATIBILITY

POLYMER  
COATING

Cell Processing

Cell-free  
Synthesis

CELLS

ANTIMICROBIAL  
PEPTIDES

Bioproduction  
Technologies

Extremophilic Algae  
@ CCCryo

MOLECULAR  
IMPRINTED  
POLYMERS  
(MIPS)

Molecular Recognition  
incl. Aptamers



At Fraunhofer IZI-BB we develop analytical and biotechnological solutions for medical problems, animal health, nutrition, cosmetics and the environment. Our research focuses on sample preparation, development of molecular recognition elements and data acquisition as well as miniaturization and automation of corresponding technologies in order to provide reliable, flexible and easy-to-use process flows for our customers.

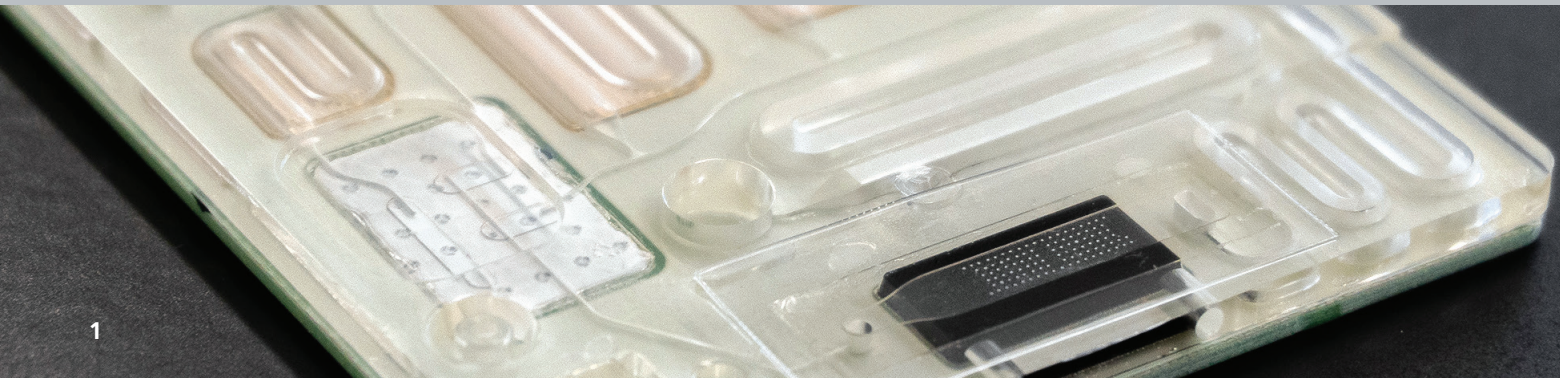
In addition, a major focus of the institute is the production of functional proteins by means of cell-free protein synthesis as well as the development of methods for obtaining, handling and manipulating cells and biomolecules.

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1 *ivD-cartridge,*  
*Photo: BiFlow Systems*

## ivD-PLATFORM

### YOUR ASSAY AT THE POINT-OF-CARE

The Fraunhofer ivD-platform was designed to perform diagnostic testing in laboratories as well as in non-laboratory environments such as doctor's offices, emergency departments or directly at the patient's home. To enable an easy usage of the system, a workflow oriented user interaction design was developed, which allows an input-free measurement.

Just by inserting the cartridge into the base-unit followed by a legitimization via user-ID card, the measurement is started automatically and the results are displayed a few minutes later.

#### Partnering possibility

The functionality of the Fraunhofer ivD-platform was already demonstrated. Further assays and assay types can easily be transferred onto the platform. Therefore exclusive partnering possibilities can be offered.

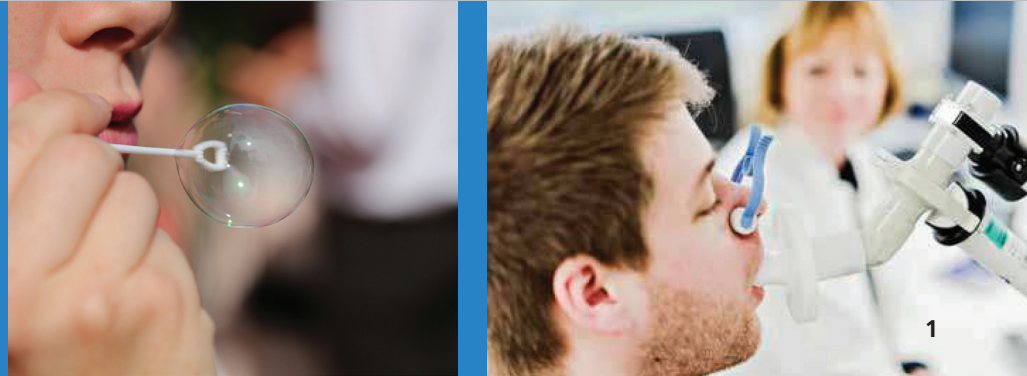
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1 Test person at the  
spirometer,  
Photo: Fraunhofer ITEM

## RESPIRATORY GAS ANALYSIS BY INTEGRATED SURFACE SOLUTIONS WITHOUT DEVICE ASSISTANCE

- Non-invasive analysis of organic compounds (cytokines, proteins, bacteria, viruses and cell fractions)
- Analytical system based on a functional integrated cellulose surface
- modified cellulose with high mechanical stability, flexibility and water absorption capacity
- combination of sampling, sample concentration and analysis



### Applications:

- infection diagnosis
- airway diseases (i.e. COPD)
- clinical and forensic drug testing

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- 1 *Bead-based Assay*
- 2 *Smartphone based lateral flow test strip readout*

## SMARTPHONE BASED DIAGNOSTICS

When unexpected health events suddenly affect our lives can restrict the speed of the information can be very valuable. If a suspicion of a disease is confirmed or refuted at an early stage, a quick and targeted reaction is also possible. An optical control, which is read out via a smartphone, can help with initial information.

Measuring dip stick lateral flow tests the presence of biomarkers / analytes within a few minutes, e.g. in the pregnancy test. Combined with quantification via a smartphone, the concentration of the analyte in serum/ blood can be determined within a few minutes. Areas of application e.g. patient monitoring after surgery and other point-of care of-Need analyses, which allow the patient to monitor himself and thus lead to an improved quality of life.



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1 *Lateral-Flow Strip*

## EQUIPMENT-FREE DETECTION OF PATHOGENS ON LATERAL- FLOW STRIPS

The on-site detection of pathogens remains a challenge for analytics. The developed test addresses this very point by combining a sensitive and specific DNA-amplification and the established technology of lateral-flow-strips. In an initial step, a defined target region of a DNA strand gets amplified by isothermal amplification. The DNA-amplification method used (RPA) is analogous to PCR, but does not require any analytical equipment for the reaction. Modified primers allow the detection of a pathogen on the test strip without further reaction steps. The color change on the test line indicates the presence of pathogenic organisms or parasites.

Results can then also be qualitatively evaluated without equipment, only by the naked eye. The methodology is comparable with the widely spread and well known application of pregnancy or drug tests. A multiplexing – the simultaneous amplification of multiple DNA-sequences in one reaction – is also possible. For instances, this permits the differentiation between pathogenic and a pathogenic organisms or the precise characterization of germs (e.g. antibiotic resistances, toxinproducing bacteria, subtyping). The presented analysis tool can be adapted to a specific analytic task and allows the simple, equipment-free detection of pathogens in less than 20 minutes.

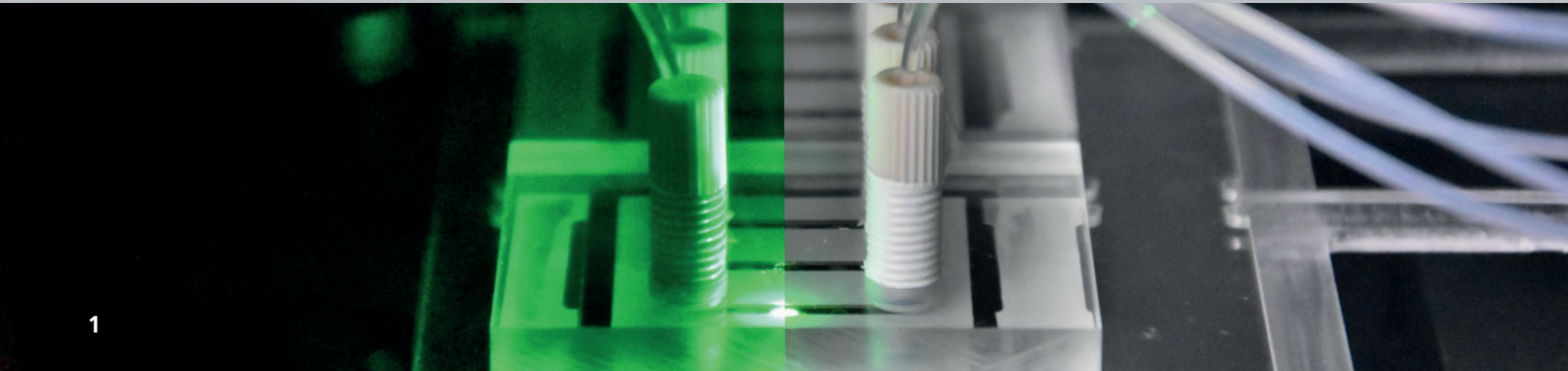
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- 1 *Organ-On-Chip-Device for controlled physiological cell cultivation in combination with real time monitoring of cell viability.*
- 2 *Organ-On-Chip-Setup consists of 12 channels operated in parallel, which are continuously perfused with fresh medium. The supply, addition of test substances and data acquisition are automated.*

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## IN-VITRO CELL MODELS AND SYSTEMS

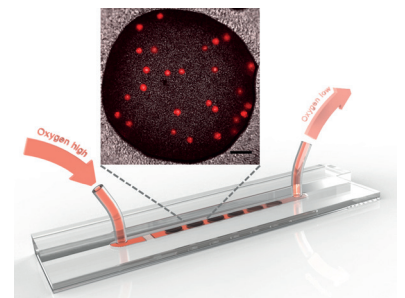
### Organ-on-Chip Systems

Development of our automated reactors to incorporate sophisticated cell models for your needs.

- 3D cell tissue
- Spheroids
- Organoids

#### Applications

- Patient-specific screening of therapies
- Disease models for drug tests
- Basic research



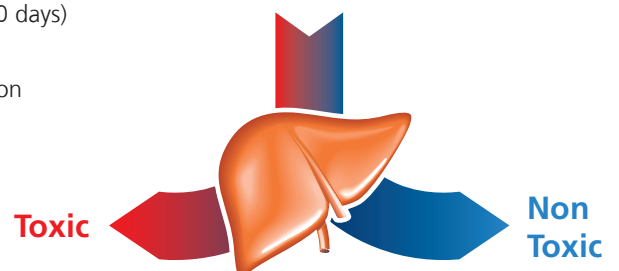
### Drug testing

Screening of your test substances in our liver reactors

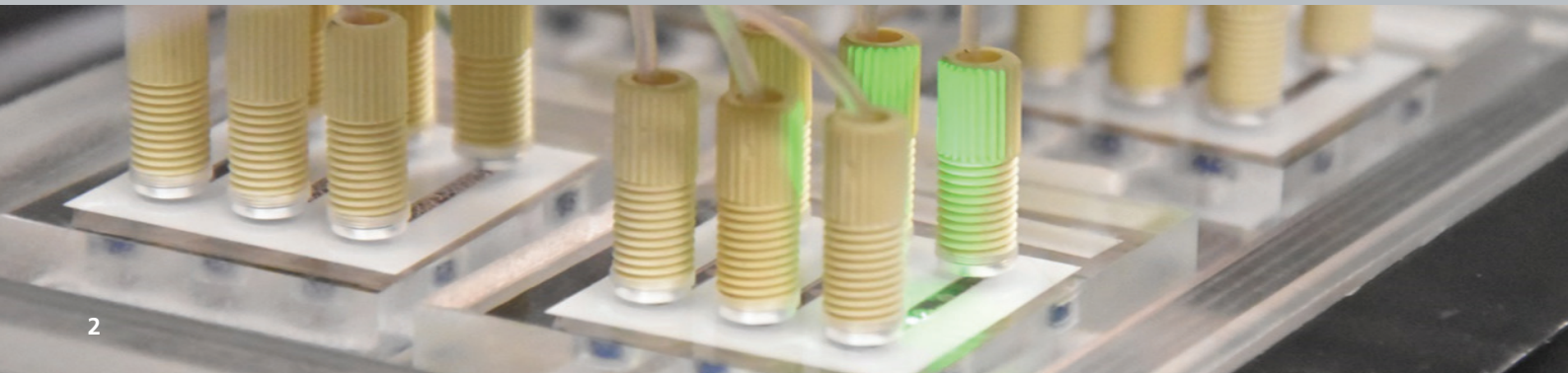
- Repeated exposure (repeated dose)
- Long-term exposure (up to 30 days)
- 12 Parallel measurements
- Investigation of mode of action

#### Applications

- Screening of chemical substances (REACH)
- Drug screening







## IN-VITRO CELL MODELS AND SYSTEMS

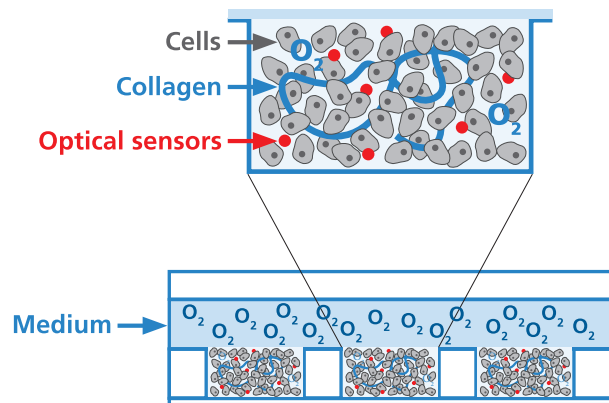
### Sensor Development

Development of optical sensors for your cell culture applications

- Real-time measurements of oxygen, pH and glucose, lactate
- Highest sensitivity with high temporal resolution

#### Applications

- Monitoring of cell vitality and nutrient supply
- Kinetic information on cell-drug interactions



### Microfluidic Platforms

Concepts and production of prototypes for individual applications

- Adaptation of (micro-)fluidics to user requirements by using Rapid Prototyping
- Adjustment of the system to your laboratory requirements
- Scalable throughput through automation

#### Applications

- Fast development of systems for proof-of-concept investigations

