



## APPLICATIONS

- Evaluation of diverse protein production options to obtain individual, optimal solutions for desired target proteins
- Development of production processes using eukaryotic cell lines for industrial protein based products and research applications
- Cell line and bioprocess optimization for the production of high quality biologicals
- Tailor-made cell-free systems for customized applications
- Development of novel and efficient HTS approaches based on cell-free protein synthesis systems
- »In vivo« vs. »In vitro« (cell-based vs. cell-free) comparison of gene sequences, initiator sequences, signal peptides and purification tags for improvement and acceleration of industrial protein production pipeline

## CONTACT

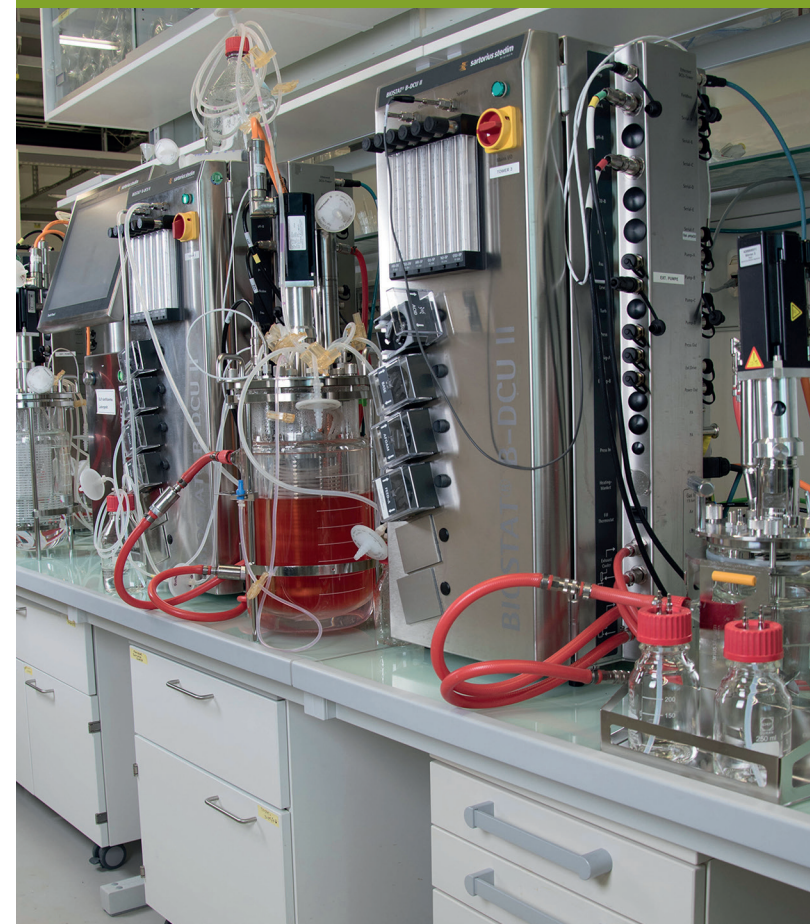
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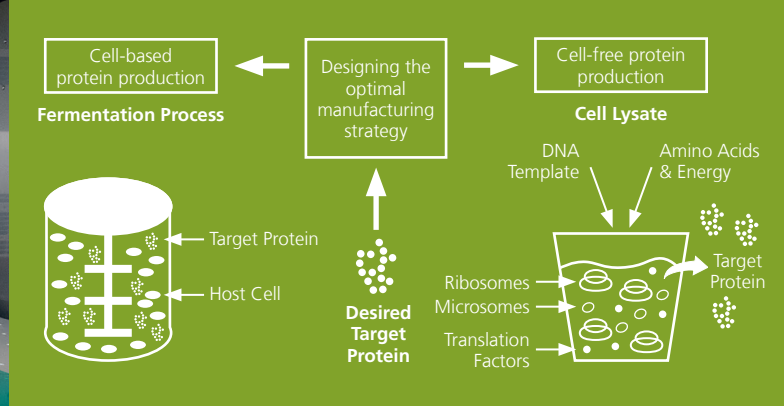
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# PROTEIN PRODUCTION TECHNOLOGIES





## CELL-FREE AND CELL-BASED PROTEIN PRODUCTION

The production of recombinant proteins is nowadays one of the main topics in biotechnology and a highly relevant part of pharmaceutical industries. Efficient strategies for the production of recombinant proteins are therefore gaining increased importance. Each protein requires individual production conditions to obtain high yields of high quality protein. The selection of an appropriate production system is a key component for successful protein expression.

At Fraunhofer IZI-BB we offer two main technologies for the production of recombinant proteins. Conventionally used *in vivo* protein production platforms based on eukaryotic cells are established systems for the production of diverse pharmaceutically relevant proteins. The application of cell lysates instead of entire cells is used to perform cell-free protein synthesis reactions. This technology enables a fast and efficient protein production within hours up to a few days. Cell-free protein synthesis in particular addresses the production of »difficult-to-express« proteins including membrane proteins and cytotoxic proteins.

### Core-technologie I: Cell-based Protein Production

The department of Cell-free and Cell-based Bioproduction provides a broad range of different platforms for cell-based protein production:

- Recombinant protein production using well-established eukaryotic cell lines (e.g. CHO, human cell lines, Sf21)
- Evaluation of transfection protocols for high protein expression levels
- Development of stable cell lines for desired processes using various clone selection and gene editing methods (e.g. CRISPR Cas)
- Establishment of pilot scale fermentation processes for recombinant protein production

### Core-technologie II: Cell-free Protein Production

A variety of cell-free protein synthesis options is available addressing individual demands of the target proteins:

- Prokaryotic cell-free systems based on *E.coli* lysates
- Eukaryotic cell-free systems based on CHO, Sf21 and K562 cell lysates
- Scale up of cell-free reaction for the production and purification of pharmaceutically relevant proteins
- HTS-compatible systems for screening approaches
- Development of novel cell-free systems based on customized cell lines

### Our Equipment to tackle your Issues

**The fermentation and cell cultivation unit** consists of fermentation vessels from lab scale (1l and 5l) to pilot scale (30l). All fermentation vessels are connected to a regulation unit enabling monitoring of process parameters according to GLP. Fermentation processes can be performed in batch, fed-batch and perfusion mode.

**Monitoring of cultivation parameter** enables a highly controlled bioprocess throughout the whole culture period. We offer fermentation monitoring (pH, pO<sub>2</sub>, lactate/glucose), microscopic analysis and dual-fluorescence cell counter analysis for growth and production monitoring as well as morphological analysis of cultured cells.

**Cell harvest and purification** realized by fixed-angle or continuous centrifugation devices and lab-scale chromatography systems.

**Cell-free reaction facility** for fast and efficient production of a broad range of difficult-to-express proteins. Various cell-free reactor formats are available.

**Functional characterization of produced proteins** based on biochemical, microscopical and electrophysiological analysis techniques.