



# Innovative Tools for Molecular and Cell Biology

## Topics in this issue:

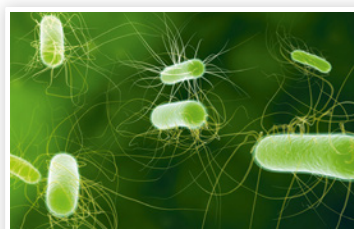
Protein Expression | Cells & Media | Cell Fractionation | Tissue Grinder | Enzyme Assays | Apoptosis Research

## Recombinant Protein Expression

- ▶ Solutions for basic research and production of biotherapeutics
- ▶ Huge selection of cloning and expression vectors
- ▶ Great number of engineered strains
- ▶ Sophisticated strategies for food grade & high-level extracellular protein production

Superior recombinant protein expression platforms accelerate basic research on protein structure and function. They can also be used for large-scale production of enzymes and biotherapeutics. Choosing the right protein expression system for your specific application is key to success.

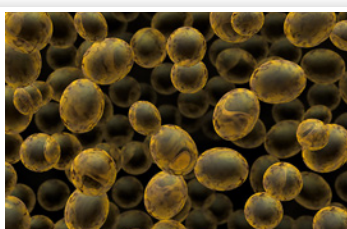
MoBiTec offers a wide selection of unique bacterial, yeast, insect, and mammalian protein expression systems to suit your research needs. Our expression tools are easy to use, designed to achieve high protein yields, and to get results quickly.



### BACTERIA Expression Systems

*Bacillus megaterium*  
*Bacillus subtilis*  
*Lactococcus lactis*  
*Escherichia coli*

*Read more on page 2*

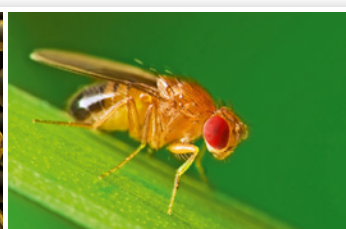


### YEAST Expression Systems

pPICHOLI Shuttle Vector System allowing protein expression in both *Escherichia coli* & *Pichia pastoris*

Ideally suited for soluble proteins with post-translational modifications & proteins toxic to *E. coli*

*Find more: [www.mobitec.com](http://www.mobitec.com)*



### INSECT Expression Systems

flashBAC™ Baculovirus Expression Systems optimized for use with TransIT®-Insect Transfection Reagent for high yield protein production

Amenable to high-throughput platforms

*Find more: [www.mobitec.com](http://www.mobitec.com)*



### MAMMALIAN Expression Systems

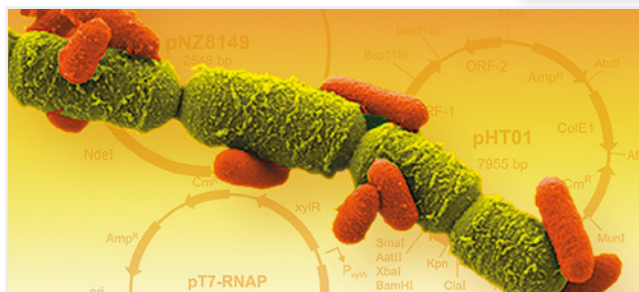
CHOgro® High Yield Expression System for transient expression in CHO cells

Streamlines development of protein-based drugs & vaccines

*Read more on page 3*

The Gram-positive bacterium *Bacillus megaterium* does not possess alkaline proteases and is known for stable replication and maintenance of plasmids. Furthermore, the bacterium is able to secrete proteins into the growth medium.

- ▶ Versatile protein production (intra- & extracellular)
- ▶ Inducible & constitutive expression systems
- ▶ Endotoxin-free
- ▶ Simple purification with different tags
- ▶ Protoplasts specifically optimized for transformation



***Bacillus megaterium* High Performance Expression System**  
Protein yield up to 10 times enhanced!

With its ability to secrete proteins directly into culture media, amenability to medium- and large-scale fermentation, no significant bias in codon usage, and designation by the U.S. FDA as an organism that is Generally Regarded As Safe (GRAS), it's not surprising that the majority of industrially-produced enzymes are expressed in *Bacillus subtilis*.

- ▶ Tightly controlled gene expression / suitable for metabolic engineering
- ▶ Avoid expensive inducers (e.g., IPTG)
- ▶ Strain with reduced protease activity available
- ▶ Endotoxin-free
- ▶ Prevent protein aggregation



- ▶ *E. coli* / *B. subtilis* shuttle vectors with different tags
- ▶ **New:** Different constitutive expression systems and vectors for high-level extracellular protein production



***Bacillus subtilis* Food Grade Expression System**  
Stable high- or low-level expression w/o addition of any antibiotics

*Lactococcus lactis* has a long history of safe usage in food production. Several expression systems, notably the NICE system, have been developed for this organism. The NICE system allows for tightly controlled expression using the food grade inducer peptide nisin.

- ▶ Stable, high-yield protein production; easy-to-handle
- ▶ Simple fermentation, scale-up & downstream processing
- ▶ Safe platform for production of biotherapeutics and diet components
- ▶ Intracellular production or secretion
- ▶ Inducible and constitutive expression systems

- ▶ Endotoxin-free, no inclusion bodies, reduced protease activity
- ▶ Expression of membrane proteins
- ▶ Suitable also for other lactic acid bacteria



## New Frontiers in Disease Prevention

**Live Biotherapeutic Production: Genetically modulated *Lactococcus lactis* bacteria that are able to *in situ* express a variety of therapeutic proteins.**

## CHOgro® High Yield Expression System - Ideal for Biotherapeutic Protein Production

A cost-effective transient transfection system for high yield protein production in suspension CHO cells. It features the CHOgro® Titer Enhancer, which provides rapid, industry-leading protein yields.

- ▶ **High Yield** - Reach higher antibody titers in seven days - faster than the ExpiCHO Expression System
- ▶ **Simple Workflow** - Same-day transfection, enhancer addition, and temperature shift
- ▶ **Worry-Free** - No commercial license required; animal origin-free

## CHO Cells... The Cell Factories of Choice

- ▶ Attractive growth characteristics
- ▶ Able to produce post-translationally modified and active protein
- ▶ Preferred cell type due to safety and regulatory concerns



- ➕ Speed up your timelines and avoid quality risks by eliminating the need to have different hosts for transient and stable expression!



Combination of advanced solutions streamlines development of protein-based drugs & vaccines

## OriCell™ Stem Cells and Products

Cyagen offers a comprehensive portfolio of stem cell lines, including embryonic stem cells and a multiple lineage of somatic stem cells derived from various species. They also provide a variety of culture supplements and differentiation media to support growth and maintenance of cells. Their products are widely cited in high-impact journals, including Nature and PNAS.

## Various Cells

- Embryonic Stem Cells
- Mesenchymal Stem Cells
- Adipose-Derived Mesenchymal Stem Cells
- Neural Stem Cells
- Fluorescent-Labeled Cells
- Primary Cells



## Various Media

- Stem Cell Culture Media
- Stem Cell Differentiation Media
- Cell Cryopreservation Media
- Primary Cell Culture Media

- ➕ Premium quality and consistency for results you can trust







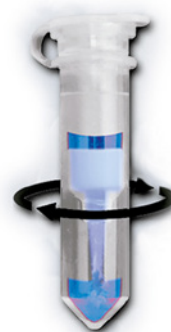
### Spin-Column-Based Cell Fractionation

Cell fractionation is the gateway to understanding the properties and functions of numerous cellular components. The Minute™ spin-column-based platform for cell fractionation provides clear advantages in speed, ease of use, reliability, and consistency over conventional methods.

Minute™ offers a complete collection of fractionation kits, including products for plasma membrane, native intact nuclei, mitochondria, endosomes, lysosomes, Golgi apparatus, endoplasmic reticulum, lipid rafts, nuclear envelope, nuclear matrix, proteasomes, chloroplasts, and plant microsomal membrane.

### The Minute™ Benefits

- ▶ Minute™ Kits for protein extraction and for sub-cellular structure fractionation
- ▶ Super-fast
- ▶ Separates cellular components while maintaining structural integrity and individual functions of the components



*The Minute™ principle: Cells rupture as they zig-zag through the pores inside the filter*



**Compatible with small sample sizes from any living organism and tissue type**



*Growing number of publications, including citations in Nature, Science, and Cell*

### Tissue Grinder

- ▶ Handheld, motor-driven homogenizer
- ▶ Resuspends pellets or disrupts soft tissue in microcentrifuge tubes
- ▶ 50 W constant power output even with heavy load samples
- ▶ Easy to operate and to clean
- ▶ No sample waste
- ▶ Stainless and plastic grinding pestles can be autoclaved



**For plant and animal tissue samples and microbes:**

Leaf | Stem | Root | Seed | Heart | Liver | Spleen | Lung | Small Intestine | Brain | Fungi | ...

### Tissue Grinder G50

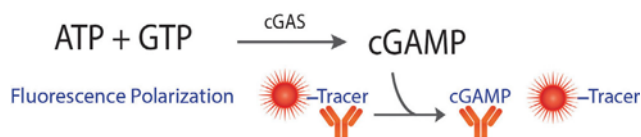
- ▶ Speed: adjustable (3000 - 8000 rpm); shown on LCD screen
- ▶ Power supply: 12V DC universal power supply
- ▶ Brushless motor: for extended life time



## HTS Compatible cGAS Enzyme Activity Assay

Cyclic GMP synthase (cGAS) is a recently discovered enzyme that is rapidly emerging as a master regulator of the immune system and thus as a compelling therapeutic target for debilitating autoimmune diseases, including lupus, as well as for cancer immunotherapy.

The new Transcreener® cGAMP cGAS Assay directly measures cyclic GMP-AMP (cGAMP) produced by cGAS. By measuring the production of cGAMP researchers can effectively determine the activity of the cGAS enzyme.



*The Transcreener® cGAMP cGAS Assay is a competitive immunoassay that uses a highly specific antibody for cGAMP and a fluorescent tracer. cGAMP displaces the tracer from the antibody resulting in a robust FP readout.*

The assay provides a powerful tool to screen entire compound libraries for cGAS modulators to help find new therapeutics targeting the cGAS-STING pathway.

- ▶ Direct detection of unlabeled cGAMP
- ▶ Easy to use, single addition, mix-and-read format
- ▶ For high-throughput screening (HTS)
- ▶ Compatibility with commonly used multimode plate readers



*Discover new treatments for autoimmune diseases & cancer*

**+** **Transcreener® HTS Assays:**  
Universal detection of nucleotide-dependent enzymes



## Topoisomerases are Important Targets for Cancer Chemotherapy Treatments & Antibiotics

Topoisomerases are nuclear enzymes that play essential roles in DNA replication, transcription, chromosome segregation, and recombination.

These enzymes are altering the topological state of DNA; they are capable of relaxing supercoiled DNA and of decatenating interlocked DNA.



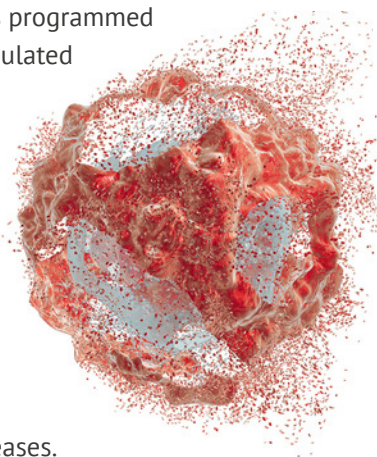
**+** **Great selection of high-throughput assays for all topoisomerase functions, including DNA relaxation, DNA supercoiling, DNA decatenation, and ATP hydrolysis.**

- ▶ For topoisomerase characterization, drug testing, and high-throughput screening (HTS) of topoisomerase inhibitors
- ▶ Fluorescence-based assays in 96-well or 384-well plate format
- ▶ General topoisomerase assays and assays for human and bacterial topoisomerases
- ▶ Gel-based DNA supercoiling, DNA relaxation, and DNA decatenation assays for visualizing the DNA topoisomerase products on agarose gels
- ▶ Also available: Topoisomerase enzymes and DNA substrates



Apoptosis, also known as programmed cell death, is a highly regulated process that eliminates damaged, infected, or redundant cells.

Incorrectly regulated apoptosis is implicated in a number of disease states, including many types of cancer, ischemic damage, Alzheimer's, and several autoimmune diseases.



### SensoLyte® Granzyme A & B Activity Assay Kits

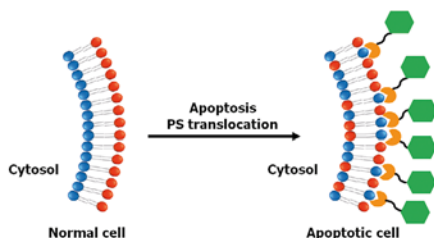
Granzymes are proteases secreted by cytotoxic lymphocytes. They are able to trigger apoptotic pathways in viral or tumor cells.

- ▶ Enzyme activity detection
- ▶ Inhibitor screening
- ▶ 1-hour assay
- ▶ FRET-based fluorimetric kits



Fluorescent conjugates of Annexin V are commonly used to identify apoptotic cells.

Annexin V is a phospholipid-binding protein that has a high affinity for phosphatidylserine (PS). During the apoptosis process the cell membrane undergoes structural changes, including translocation of the phospholipid



phosphatidylserine from the inner to the outer leaflet of the plasma membrane, where it can be detected by Annexin V conjugates.

- ▶ Fluorescent Annexin V conjugates are available as standalone reagents and in a variety of kits
- ▶ For flow cytometry or fluorescence microscopy
- ▶ Conjugates for all available lasers
- ▶ Assay procedure typically completed in less than 30 minutes



The activation of caspase enzymes occurs very early in the apoptotic process. These proteases are crucial mediators of the complex biochemical events associated with apoptosis. Caspase substrates provide a means to detect and measure caspase activity. These short peptide sequences labeled with fluorophores, once recognized and cleaved by a given caspase, produce measurable changes in fluorescence.

- ▶ Substrates: Ac-IETD-AFC (Caspase-8/10); Ac-LEHD-AFC (Caspase-9); Ac-DEVD-AFC (Caspase-3/7)
- ▶ Fluorescence detection via fluorimeter or plate reader
- ▶ Also available: various Caspase Activity Assay Kits

