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Streamlining Biologics Development with the Expi Expression Systems

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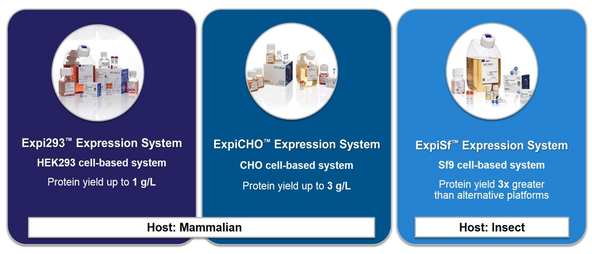
ABSTRACT & INTRODUCTION

Biologics-based medicines is a rapidly growing field and a promising solution to address many unmet medical needs. To meet market demands, biopharmaceutical developers are actively looking for more efficient and robust production platforms to reduce timelines and overall development costs. Throughput, productivity, and scalability of the expression platform as well as availability of well-documented production cell lines are key selection criteria when initiating a biologics campaign. To this end, the Gibco™ Expi Expression Systems are complete platforms that can speed up biologics development by enabling rapid, high-yield, and scalable protein or virus production from mammalian (ExpiCHO™ and Expi293™) and insect (ExpiSf™) cells. By providing flexible and high-productivity solutions from three different cell hosts using optimized components, the Expi systems support every stage of your biologics development. This unified, end-to-end approach, reduces key product quality risks during development as one can use the same cell line from research to large-scale production while streamlining process development by utilizing integrated reagents for unmatched performance.

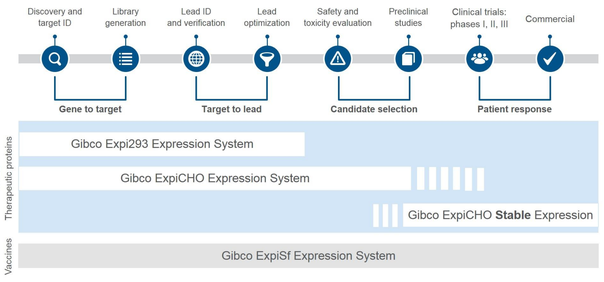


What makes the Expi Systems Unique?

Complete, optimized systems to enable:

- High protein yields
- Lower cost/mg of protein
- Fast speed to protein
- Higher throughput
- Scalability
- Flexibility

Flexible Solutions for all Stages of Biologics Development



Mammalian Expression with Expi293 and ExpiCHO Expression Systems

	Expi293 *Highest-yield and most flexible 293-based system*	ExpiCHO *Highest-yield and most cost-effective CHO-based system*
Protein yield[1]	Up to 1 g/L	Up to 3 g/L
Cells	Expi293F	ExpiCHO-S
Media	Expi293 Medium	ExpiCHO Medium
Transfection Reagent	ExpiFectamine 293	ExpiFectamine CHO
Control vector	Antibody-expressing vector	
Expression Vector[2]	pcDNA™3.3 pcDNA™3.4	
Max. VCD	6 x 10^6/mL	10 x 10^6/mL
Cell density for transfection	3 x 10^6/mL	6 x 10^6/mL
Time to Protein	5-7 days	8-14 days
Additional Cell Lines	Expi293F (cGMP) Expi293F GnTI- Expi293F Inducible	ExpiCHO-S (cGMP)

Figure 1. Expi293 and ExpiCHO system specifications:
[1] Typical yield of human IgGs; [2] other mammalian expression vectors can also be used. VCD = viable cell density.

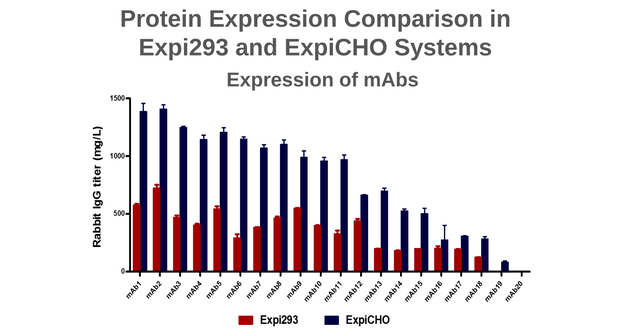


Figure 2. Protein expression comparison data:
Different classes of proteins were expressed in Expi293 and ExpiCHO systems following respective system protocols.

Maintain Protein Quality and Function from Research to Production with ExpiCHO

Figure 3. New product offerings:
Fully-characterized, cGMP-banked ExpiCHO-S cells are available for licensing. ExpiCHO Stable Production Medium support large-scale culture of ExpiCHO-S stable clones and is formulated without hypoxanthine and thymidine for use in dihydrofolate reductase (DHFR)-amplified systems, without L-glutamine or GlutaMax™ for use in glutamine synthetase systems, and without phenol red. It is not compatible for use as a medium during transfection and selection stages.

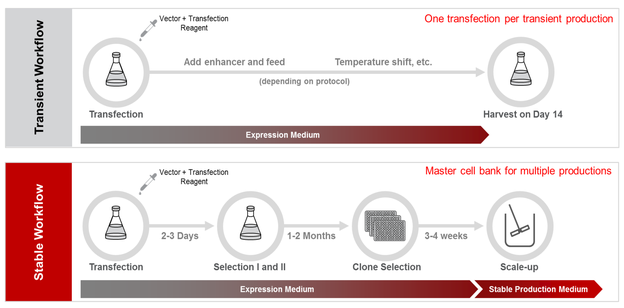


Figure 4. Transient vs stable workflow:
An overall graphical representation for both types of transfection workflows.

Direct Adaptation to ExpiCHO SPM

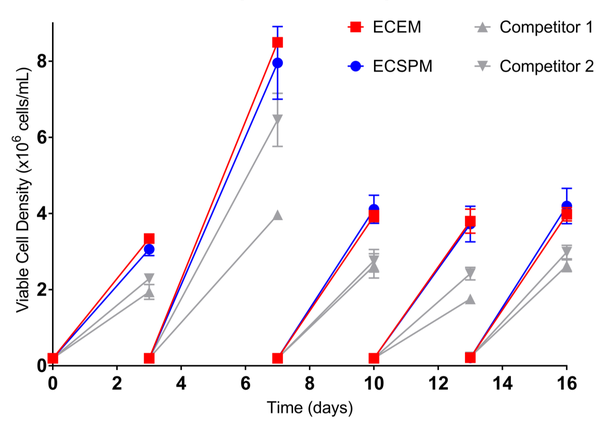


Figure 5. Direct adaptation to ExpiCHO SPM:
Clones were developed and passaged every 3 to 4 days into ECEM (red), ECSPM (blue), or two competitors (grey). Cells were seeded at 2x10^5 cells/mL in shake flasks. ExpiCHO SPM (ECSPM) showed that no adaptation was required and achieved growth comparable to the control (ExpiCHO Expression Medium - ECEM). VCD for ECSPM exceeded the competitor media growth.

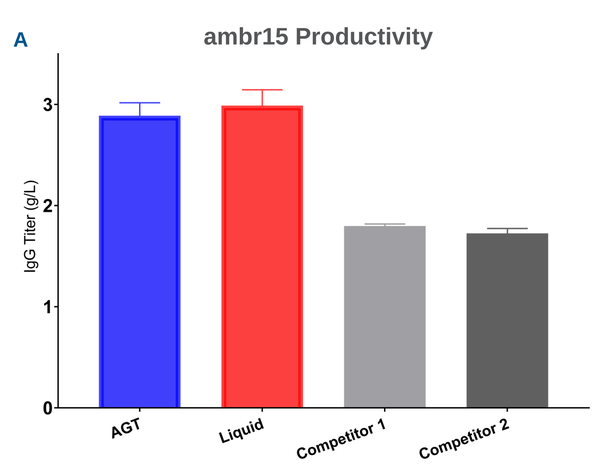


Figure 6. 14-day ambr15 study:
Stably transfected clone was run in all conditions. AGT, liquid conditions (n=12), and competitor media (n=3). ExpiCHO SPM is consistent between formats and surpassed competitor media in both titer (A) and growth (B).

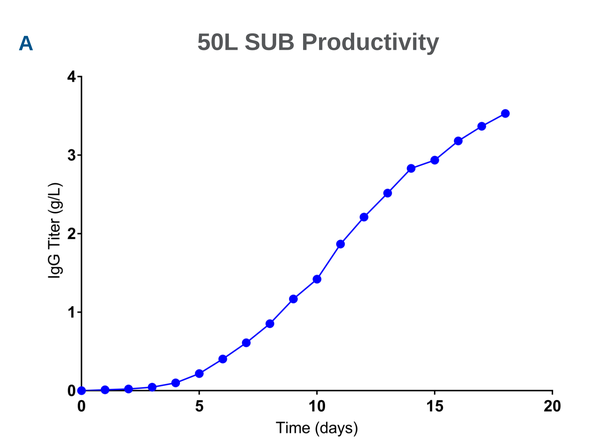


Figure 7. 18-day 50L SUB run:
ExpiCHO SPM supports scalability and high titer of ExpiCHO-S stable clone (A) without a need for adaptation (B). The clone was frozen in ExpiCHO Expression Medium, requiring only 3 passages prior to inoculation.

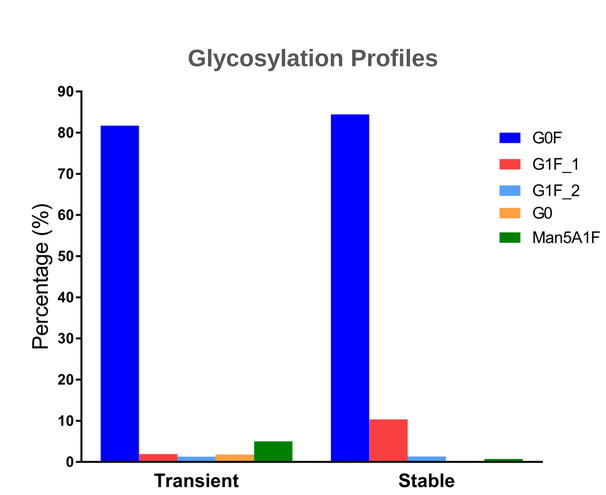


Figure 8. Glycosylation profiles in transient vs stables:
Glycosylation profile is similar between transiently-produced IgG compared to the same protein expressed in a previously-generated ExpiCHO-S stable clone.

Insect Expression with the ExpiSf System

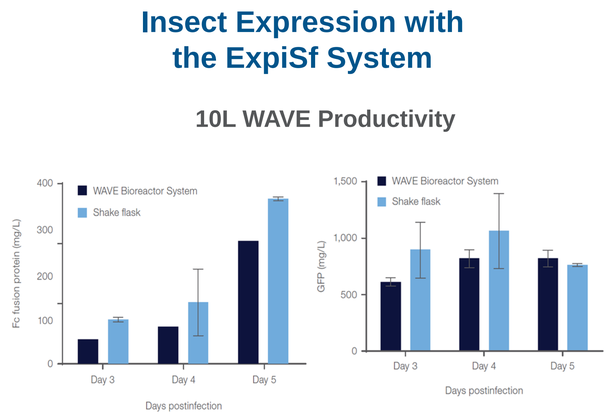
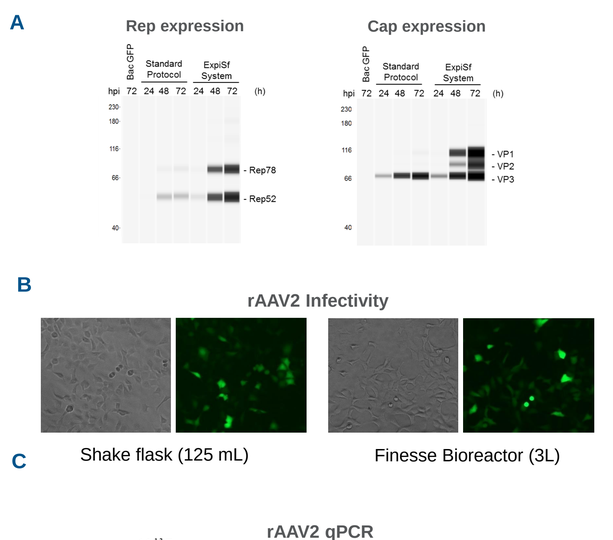


Figure 9. ExpiSf scalability from small to large scale:
Comparable growth kinetics and protein yields between shake flask and 10L WAVE Bioreactor scales for two representative proteins.

rAAV Expression



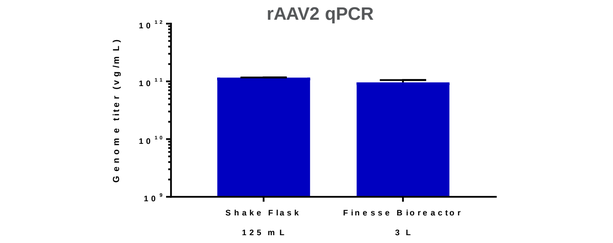


Figure 10. recombinant AAV2 expression in ExpiSf:
ExpiSf9 in ExpiSf CD Medium and Sf9 cells in Sf-900™ II SFM were triple infected with Rep, Cap and ITR-GFP baculovirus in 125-mL shake flasks and 3L Finesse™ Bioreactor. A. rAAV2 Rep and Cap protein production is higher in ExpiSf system compared to Standard Protocol (Sf9 cells in Sf-900 II SFM). B. rAAV2 functionality was assessed by infectivity assay using HEK293A cells and visualized by fluorescent microscopy. C. rAAV2 genome titer was quantified by qPCR.

VLP Expression

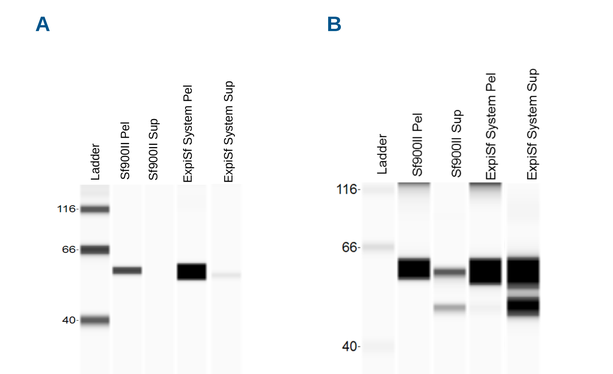


Figure 11. Virus Like Particle (VLP) Expression in ExpiSf:
A. Chikungunya virus like particles expressed in Sf9 cells in Sf-900 II SFM and ExpiSf System. B. Human papilloma virus like particles expressed in Sf9 cells in Sf-900 II SFM and ExpiSf System.

TRADEMARKS/LICENSING

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