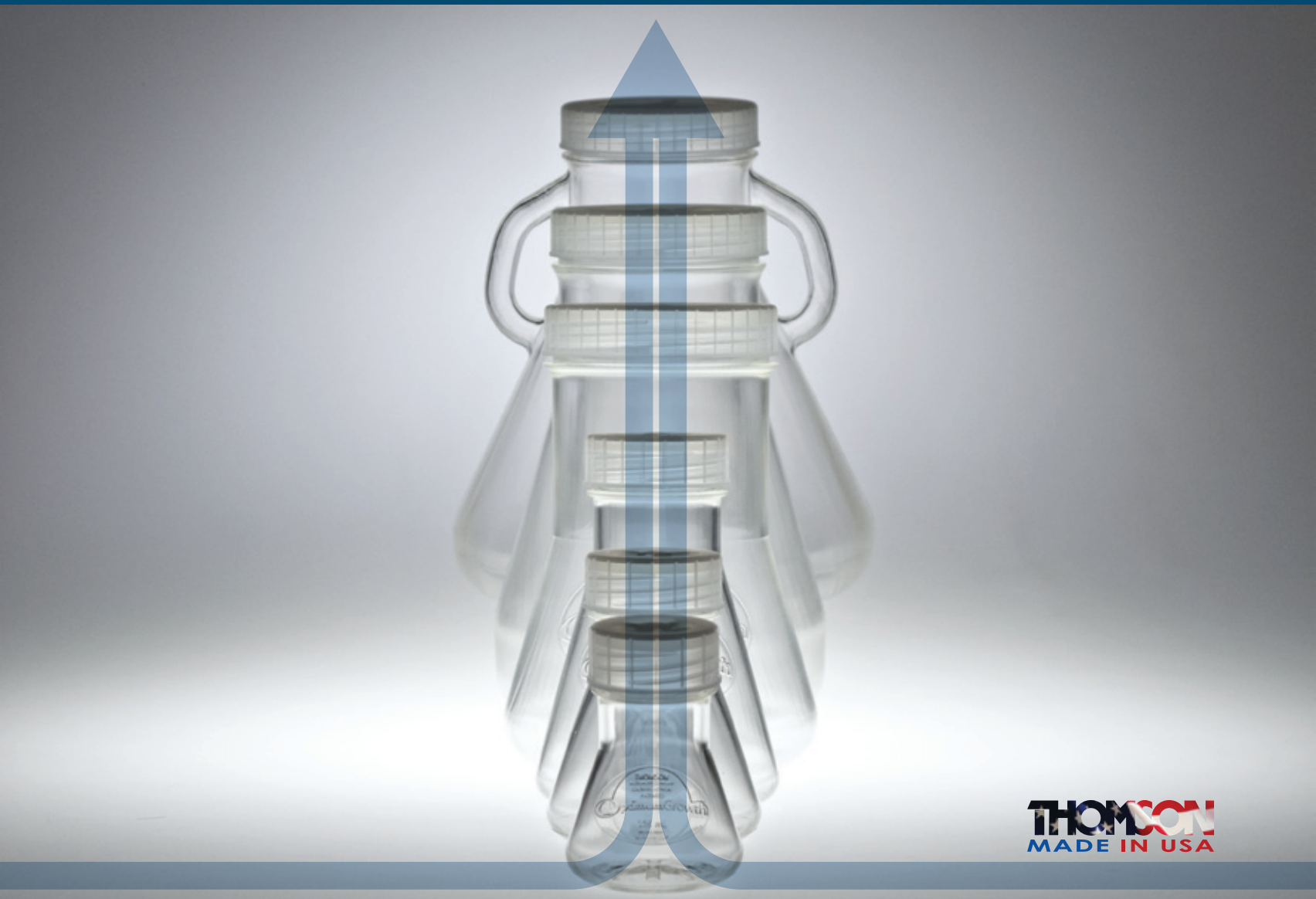
THOMSON Solutions ™ At Work
INSTRUMENT COMPANY

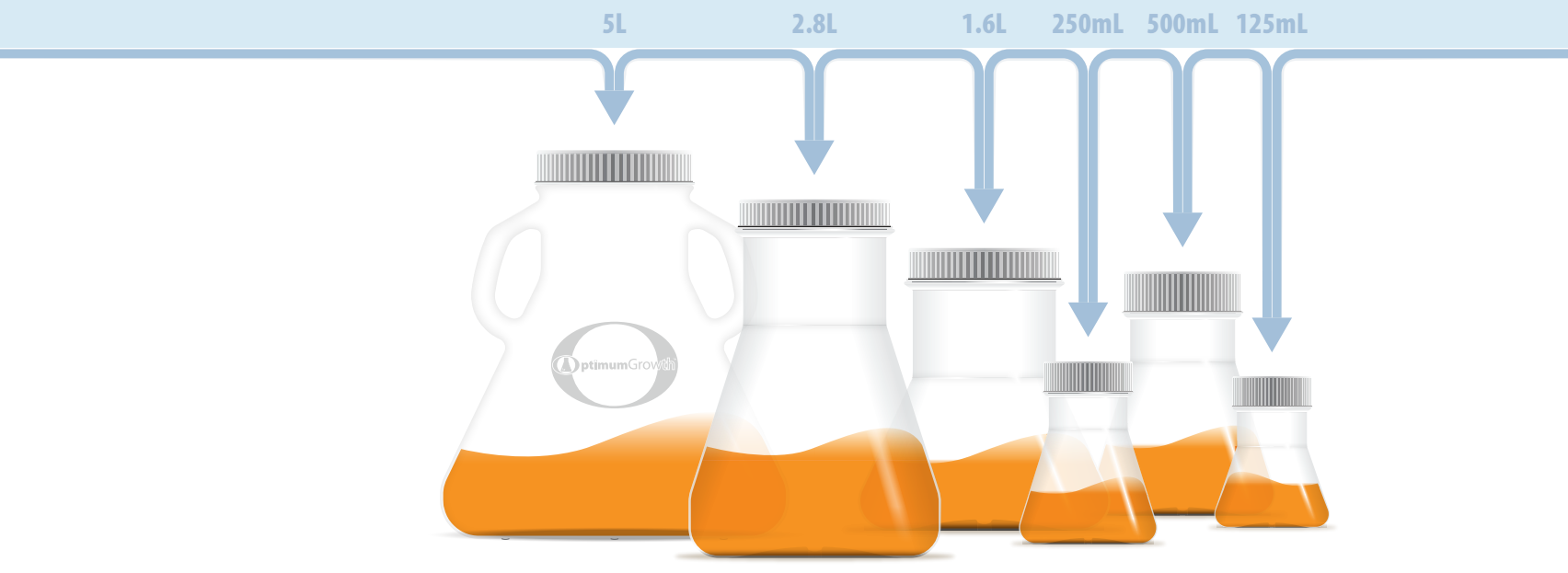
OptimumGrowth™

GENERAL INFORMATION



MADE IN USA

SCALABILITY FROM 125ML - 5L FLASK



Optimum Growth™ Flasks have 0.2µm PTFE Vent Caps

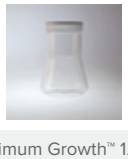
Key Features

- Baffles designed for High Aeration & Low Shear
- Same Footprint as Comparable Fernbach Flask
- Less Foaming than Disposable Fernbach
- Transfer Cap option connects directly to cell bags™ & bioreactors with quick connect, luer lock or tube fusing
- .2µm Vented Cap
- Individually Packaged and Sterilized

Scalability

Thomson Optimum Growth™ Flasks are designed in a way that protein production which will scale consistently across all sizes, unlike any other shake flasks on the market. Additionally, these flask features allow for consistent shake speeds from the 125mL up to 5L flasks.

Optimum Growth™ Flask Specifications

Flask Size	125mL	250mL	500mL	1.6L	2.8L	5L
Part #	931110	931111	931112	931113	931114	931116
Image						
Description	Optimum Growth™ 125mL Flask w/ Vent Cap - Sterile	Optimum Growth™ 250mL Flask w/ Vent Cap - Sterile	Optimum Growth™ 500mL Flask w/ Vent Cap - Sterile	Optimum Growth™ 1.6L Flask w/ Vent Cap - Sterile	Optimum Growth™ 2.8L Flask w/ Vent Cap - Sterile	Optimum Growth™ 5L Flask w/ Vent Cap - Sterile
Qty/Case	50	50	25	12	6	4

Space Saving More Volume

Optimum Growth™ Flasks Give Excellent Growth with Space Saving Capability

6 x Corning® 3L Total Volume 6L/Shaker

18 x 1.6L Optimum Growth™ Flasks for Total Volume 16.2L/shaker

12 x Optimum Growth™ 2.8L Flasks Total Volume 16.8L/Shaker

8 Position Carrier available for 125mL & 250mL Flasks

Fill Volumes & Shake Speeds

For all tables | 1” = 25mm | 2” = 50mm

CHO Stable Cells, CHO Transient, HEK 293 Transient

Flask Size	Best Fill Volume	*RPM in 1”/2”
125mL	63mL	150 / 110
250mL	150 mL	150 / 110
500mL	250mL	150 / 110
1.6L	900mL	150 / 110
2.8L	1.4L	150 / 110
5L	2.0L-3.0L	120 / 90

Minimum Fill Volume
CHO Stable Cells, CHO Transient, HEK 293 Transient

Flask Size	Best Fill Volume	*RPM in 1”/2”
125mL	24mL	120 / 90
250mL	50 mL	120 / 90
500mL	100mL	120 / 90
1.6L	400mL	100 / 80
2.8L	900mL	100 / 80
5L	1.2L	90 / 70

Insect Cells

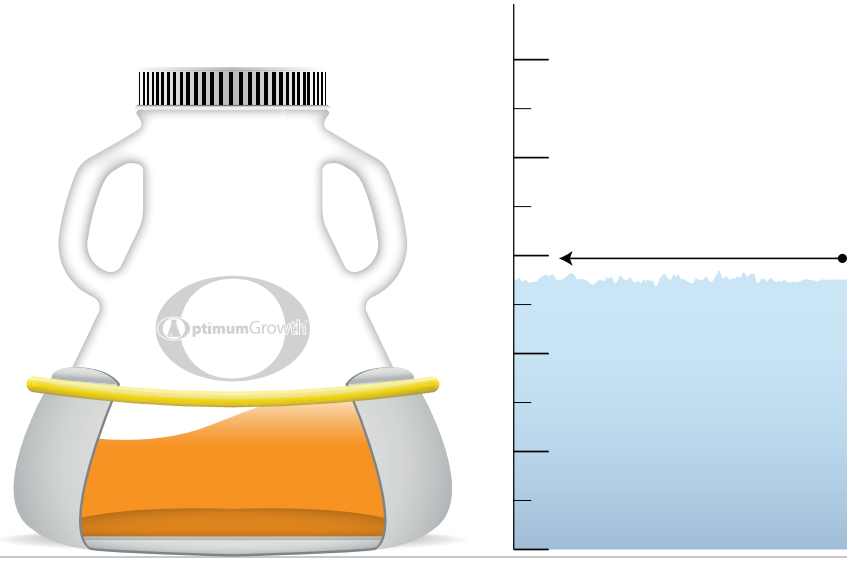
Flask Size	Best Fill Volume	*RPM in 1”/2”
125mL	63mLs-75mL	150 / 110
250mL	150 mL	150 / 110
500mL	250mL	150 / 110
1.6L	900mL	150 / 110
2.8L	1.4L	150 / 110
5L	2.0L - 3.0L	135 / 90

Microbes/E. coli

Flask Size	Best Fill Volume	*RPM in 1”/2”
125mL	63mL	250 / 150
250mL	125 mL	250 / 150
500mL	250mL	250 / 150
1.6L	900mL	250 / 150
2.8L	1.4L	250 / 150
5L	2.0L-3.0L	250 / 150

Hybridoma Cells

Flask Size	Best Fill Volume	*RPM in 1”/2”
125mL	36mL	70 / 50
250mL	75mL	70 / 50
500mL	150mL	70 / 50
1.6L	480mL	70 / 50
2.8L	1.4L	120 / 90
5L	2L	120 / 90



Optimum Growth™ Flask FAQs

http://htslabs.com/techcenter/cellculture/optimum-growth/faq.php

What have people done successfully to change vessels from Spinner flasks & Roller bottles to Optimum Growth™ Flasks (patented)?

Cells adapted to spinner flasks and roller bottles can be easily transitioned to Optimum Growth™ Flasks by reducing the shake speeds of the first 1-2 passages (See chart with Minimum Fill Volume Speeds) because spinner flasks and roller bottles have lower shear than shake flasks. Once the cells have adjusted to the flasks, recommended speeds will work well. Additionally, up to 1% of surfactant to the media may be needed.

Why do Optimum Growth™ Flasks work better than other disposable flasks (non-baffled or baffled) for mammalian cell lines (CHO, HEK293, etc.) & insect cell lines (SF-9, SF-21, High Fives, Trichoplusia ni)?

Optimum Growth™ Flasks are disposable shake flasks designed for high aeration and low shear. Optimum Growth™ Flasks achieve high aeration due to a unique baffle design that has been optimized for mammalian and insect cell lines. They provide good gas exchange with low shear mixing, and can increase yields significantly when combined with both nutrient enriched media and proper pH balance.

What clamps and shakers work best with the Optimum Growth™ Flasks?

Optimum Growth™ Flasks are designed to shake in 1" or 2" orbit shakers. Sticky tape or rug gripper pad is recommended for under 170 rpm. Our 125mL, 250mL and 500mL flasks will work with standard shake flask clamps. The 1.6L and 2.8L flasks will need special clamps. The 5L flask will fit a standard 2.8L or 3L Fernbach shake flask clamp.

Are the Optimum Growth™ Flasks single use?

Yes, the Optimum Growth™ Flasks are designed for single use. They are competitively priced compared to disposable bioreactors or shake flasks from other manufacturers. They are NOT autoclavable.

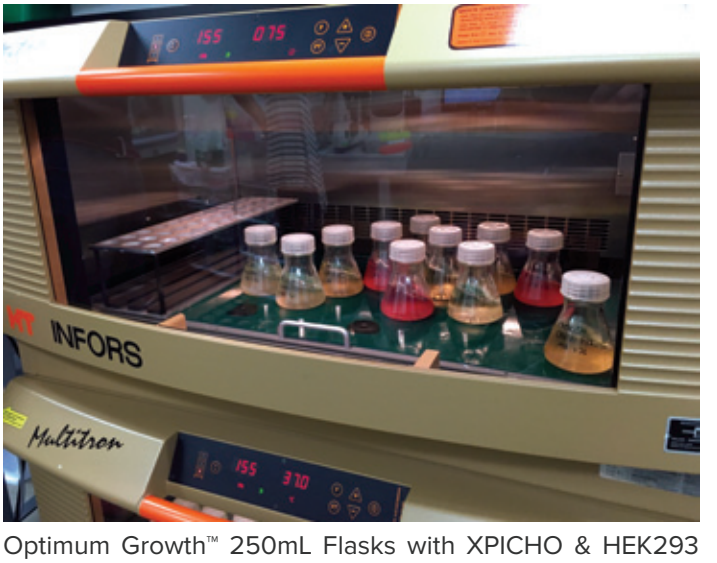
What are the Transfer Caps that go along with the Optimum Growth™ Flasks?

Inversion & Bidirectional Optimum Growth™ Transfer Caps (patented) allow for a quick stress free cell transfer between flask and downstream vessel (Optimum Growth™ Flasks, cell culture bags, bioreactors, etc.). Inversion Transfer Caps simply use the power of gravity to facilitate transfer, thus maintaining higher culture viability than pumping methods. Bidirectional Transfer Caps simply use a standard pump to transfer culture and/or media and come in a wide variety of tubing sizes.

How can you best use media from ThermoFisher such as F17 and its derivatives?

FreeStyle™ F17 Expression Medium contains lower amounts of pluronic than other comparable medium. Cells grown in this media may experience more shear stress due to the lower amount of surfactant. To avoid this, add in additional pluronic (ThermoFisher PN 24040032). The recommended range of pluronic to add is 0.05 gm/L to 0.2 gm/L. Up to 1% simethicone from MilliporeSigma (PN 59920C) can also be used. Either of these methods can work to reduce foaming and restore high culture viability.

Optimum Growth™ 2.8L Flasks fit 12 per shaker



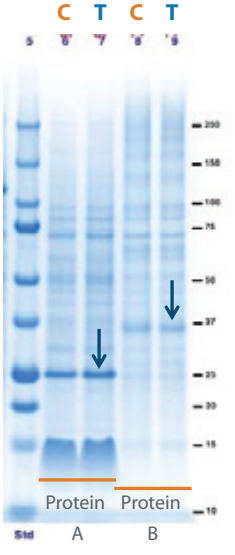
Optimum Growth™ 250mL Flasks with XPICHO & HEK293 Cells in shaker

Thomson Instrument Company is not affiliated with ThermoFisher, MilliporeSigma or their products

Corning® vs Optimum Growth™ Flasks

2 Membrane Proteins Expressed

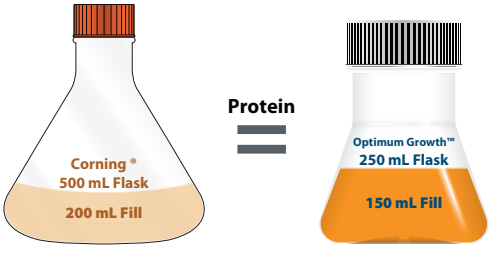
Data provided by Genentech part of the Roche Group



Corning® – 500mL flask, 200mL culture

Thomson – 250mL flask, 150mL culture

4mL samples purified over Ni NTA



Protein A – Membrane protein of moderate expression, 34kDa

Protein B – Membrane protein of low expression, 45kDa

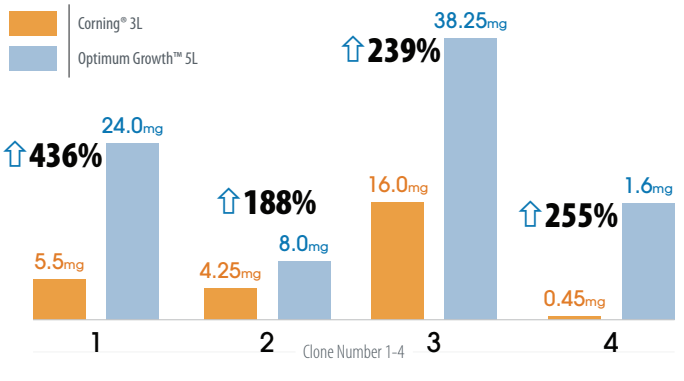
12µL of elution resolved on a coomassie gel

Conclusion: Thomson flasks work at least as good as Corning® standard. Improved working volume / flask volume ratio when using Thomson.

214% Yield Increase From Insect Cells

Protein Production/Flask

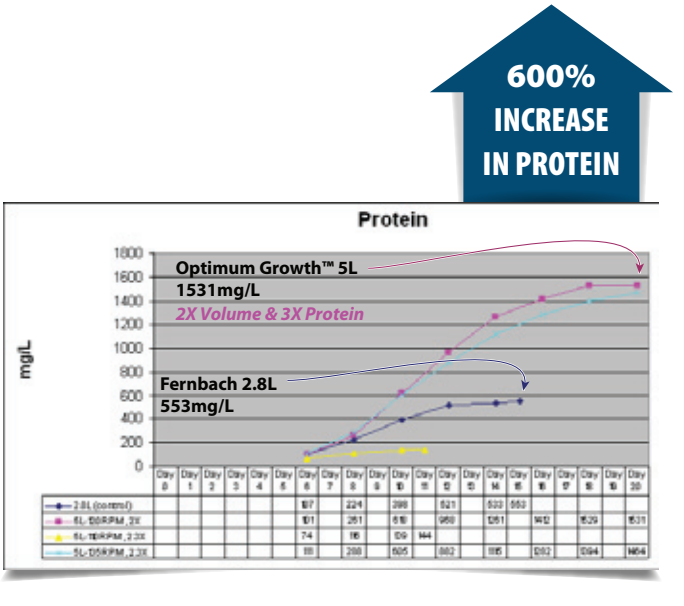
Data supplied by New York Structural Genomics Researsh Consortium



Same Footprint-Double Volume

Optimum Growth™ 5L (3L Media)

vs Nalgene® Nunc 2.8L (1.5L Media)



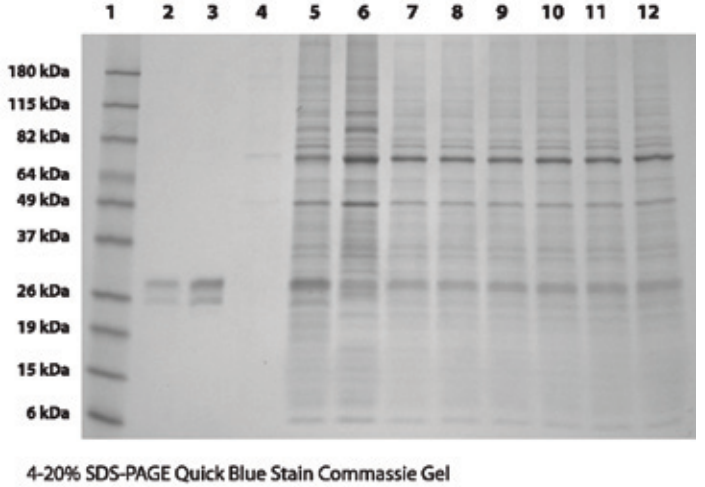
Thomson Instrument Company is not affiliated with Corning Life Sciences®, Nalgene Nunc®, Genentech, NYSGRC or their products.

High & Low Expressing Proteins in HEK293 Cells

Low Expressing Gel

This gel shows equal bands from 5 replicates of a low expressing protein, producing roughly 10 to 20 mg/L.

1. Benchmark Pre-Stained Protein Ladder
2. Purified protein, 100 ng control
3. Purified protein, 200ng control
4. Untransfected cells, -ve control
5. +ve control
6. +ve control
7. Protein of interest, 5L Combined Flasks #1-5
8. Protein of interest, 5L Flask #1
9. Protein of interest, 5L Flask #2
10. Protein of interest, 5L Flask #3
11. Protein of interest, 5L Flask #4
12. Protein of interest, 5L Flask #5

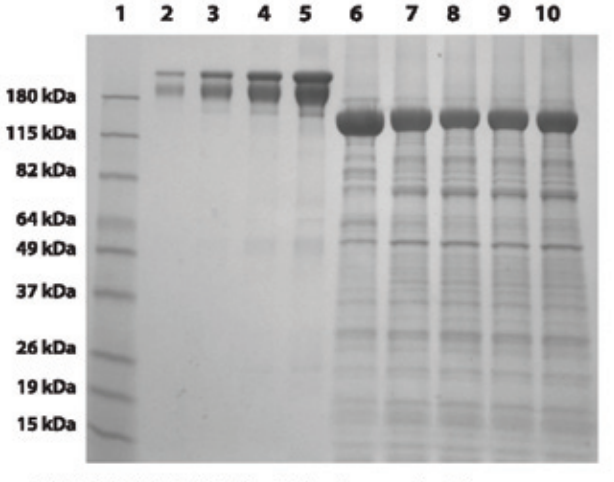


4-20% SDS-PAGE Quick Blue Stain Commassie Gel
Expected MW of dimer 24.5 kDa Estimated expression level ~10-20 mg/L

High Expressing Gel

Thomson 5L flasks are consistently able to maximize production of your best expressers. This gel shows equal bands from 3 replicates of a high expressing protein, producing approximately 300 mg/L.

1. Benchmark Pre-Stained Protein Ladder
2. Purified mAb 100 ng control
3. Purified mAb 250 ng control
4. Purified mAb 500 ng control
5. Purified mAb 1000 ng control
6. +ve control
7. Protein of interest, 5L Flask #1
8. Protein of interest, 5L Flask #2
9. Protein of interest, 5L Flask #3
10. Protein of interest, 5L Combined Flasks #1-3

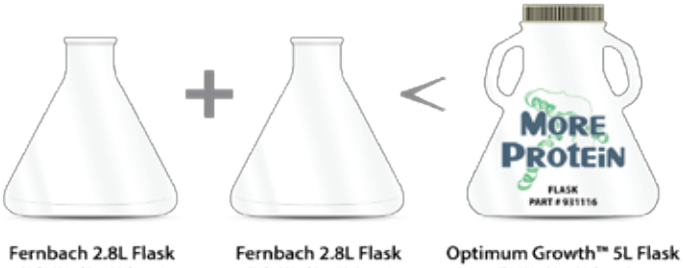


4-20% SDS-PAGE Quick Blue Stain Commassie Gel
Expected MW of dimer 159.4 kDa Estimated expression level ~300 mg/L

Conclusion

Thomson Optimum Growth™ Flasks not only ensure consistent expression from Hek293 strains, they can also increase shaker capacity. With the same footprint as a typical Corning® 3L flask and a culture volume of up to 3L, the Optimum Growth™ 5L Flask may increase production 200%, if not more, in the same space (this is construct dependent).

Most constructs express at higher levels in the Optimum Growth™ 5L flasks. This makes one Optimum Growth™ 5L equivalent to, if not greater than, two 3L flasks.



Fernbach 2.8L Flask (1.5L Working Volume) | Fernbach 2.8L Flask (1.5L Working Volume) | Optimum Growth™ 5L Flask (3L Working Volume)

THOMSON
MADE IN USA

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