

THOMSON Solutions
INSTRUMENT COMPANY At Work

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PROTEIN GROWTH



The Ultra Yield Flask/AirOtop Seal Advantage

- The Ultra Yield Flask incorporates the use of 6 large baffles that run from the outside of the flask body to the center. These 6 baffles are also taller than those found in other shake flasks. The Ultra Yield Flask has both a wide body and wide neck design that allows for greater oxygen transfer and enhances the growth of microbes.
- 10X increased aeration/ High Gas exchange seal



Ultra Yield Flask

Quick Stats

- Polypropylene
- Individually packaged and pre-sterilized
- ✦ Sizes: of 125mL, 250mL, 500mL, & 2500mL
- Enhanced AirOtop seals
- ✦ Cost: \$4-\$13 per Flask depending on size.



Data Process Changes:

Case study by  GlaxoSmithKline

Old Methods From the Dark Ages of Cell Culture

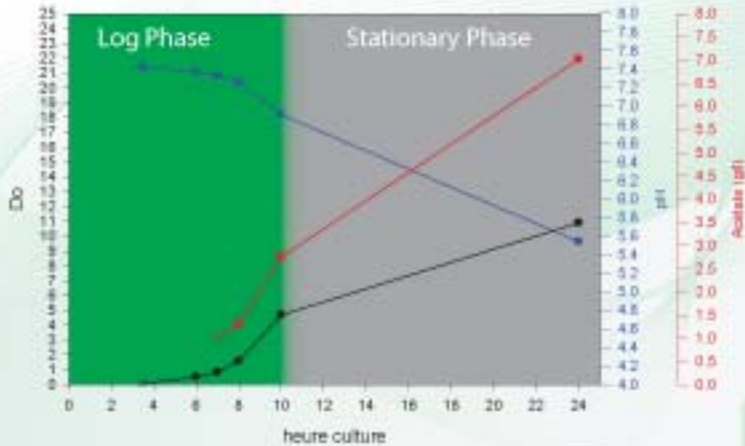
- LB Media
- Tin foil coverings, paper towels
- Non buffered media
- >230 rpm
- Sticky tape
- Glass flasks



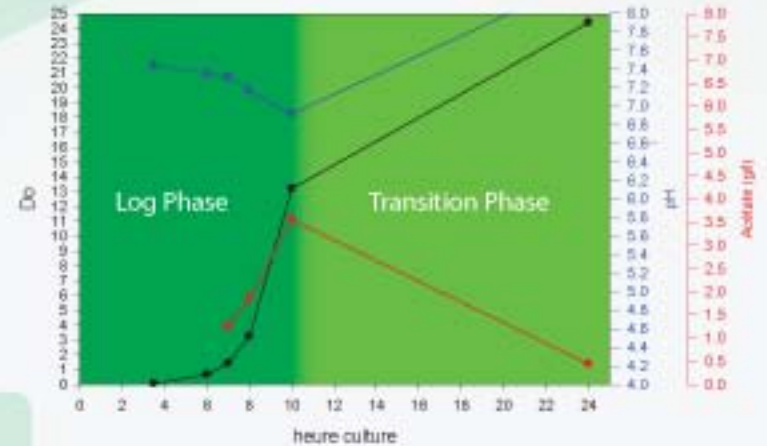
Ultra Yield Flask Process Changes for Maximum Yield

- Enriched media ie. TB
- Higher shaker speed ~ 300-350rpm
- Enhanced AirOtop seals
- Buffered media MOPS ~ 7.4pH
- Flask clamps (no sticky tape!)

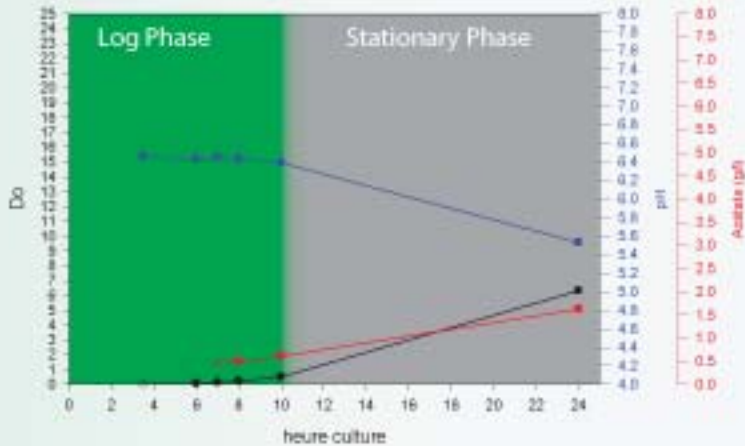
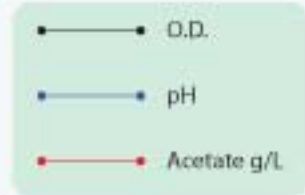




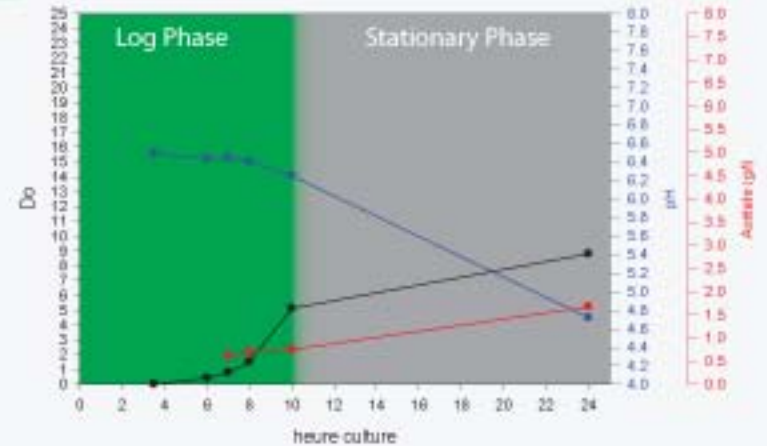
E.coli : Growth profiles with classical glass flask (2 L, no baffle), 400 mL Thomson medium, 400 rpm orbital shaker



E.coli : Growth profiles with Thomson flask (2.5L Ultra Yield Flask, baffles), 500 mL Thomson medium, 400 rpm orbital shaker

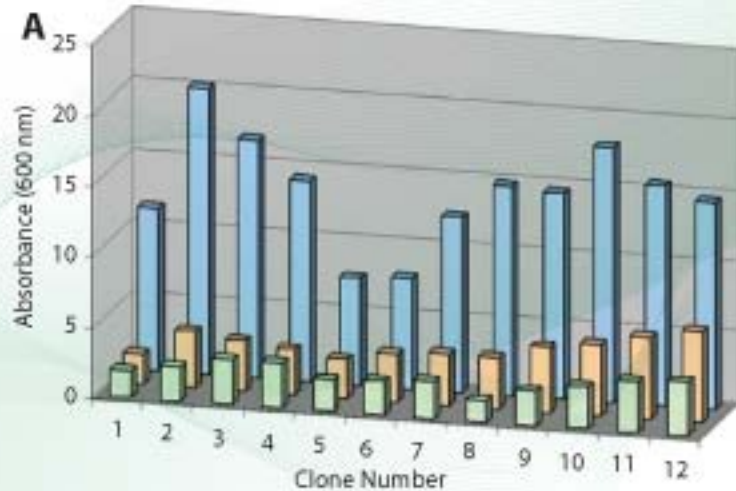


E.coli : Growth profiles with classical glass flask (2 L, no baffle), 400 mL Thomson medium, 400 rpm orbital shaker



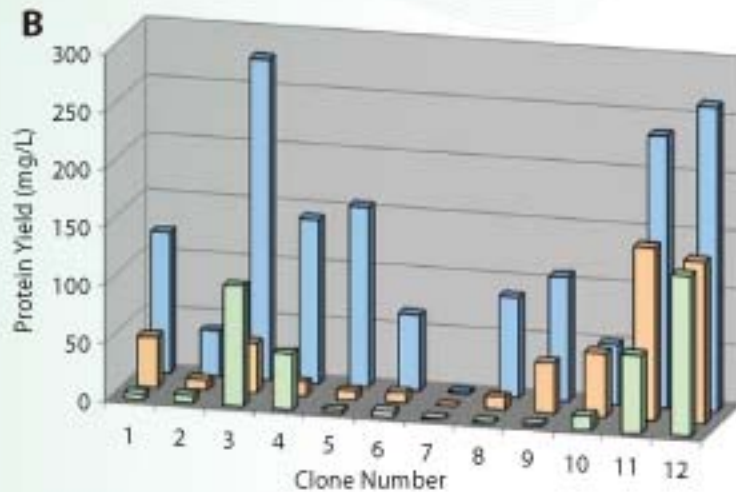
E.coli : Growth profiles with Thomson flask (2.5L Ultra Yield Flask, baffles), 500 mL Thomson medium, 400 rpm orbital shaker

Pfizer Protein Expression Data



610% Yield Increase*

Effect of flask design on *E. coli* culture growth and production of recombinant protein. (A) The effect of flask type and growth medium on the observed optical densities of the cultures at A600 following overnight protein expression. Cultures carried out in Fernbach flasks using either LB medium or TB medium are shown, respectively, at the front (green) and in the center (orange). Cultures grown in Ultra Yield™ flasks in TB medium are shown at the back (blue). See Table 1 for a list of the recombinant proteins overexpressed by the various clones. (B) The yields of expressed soluble protein (determined by protein assay and recorded as mg protein per liter of expression culture) from the IMAC columns following purification of the twelve polyHis-tagged recombinant proteins, each expressed under the three conditions described in Panel A. Clone locations in Panel B are the same as those in Panel A



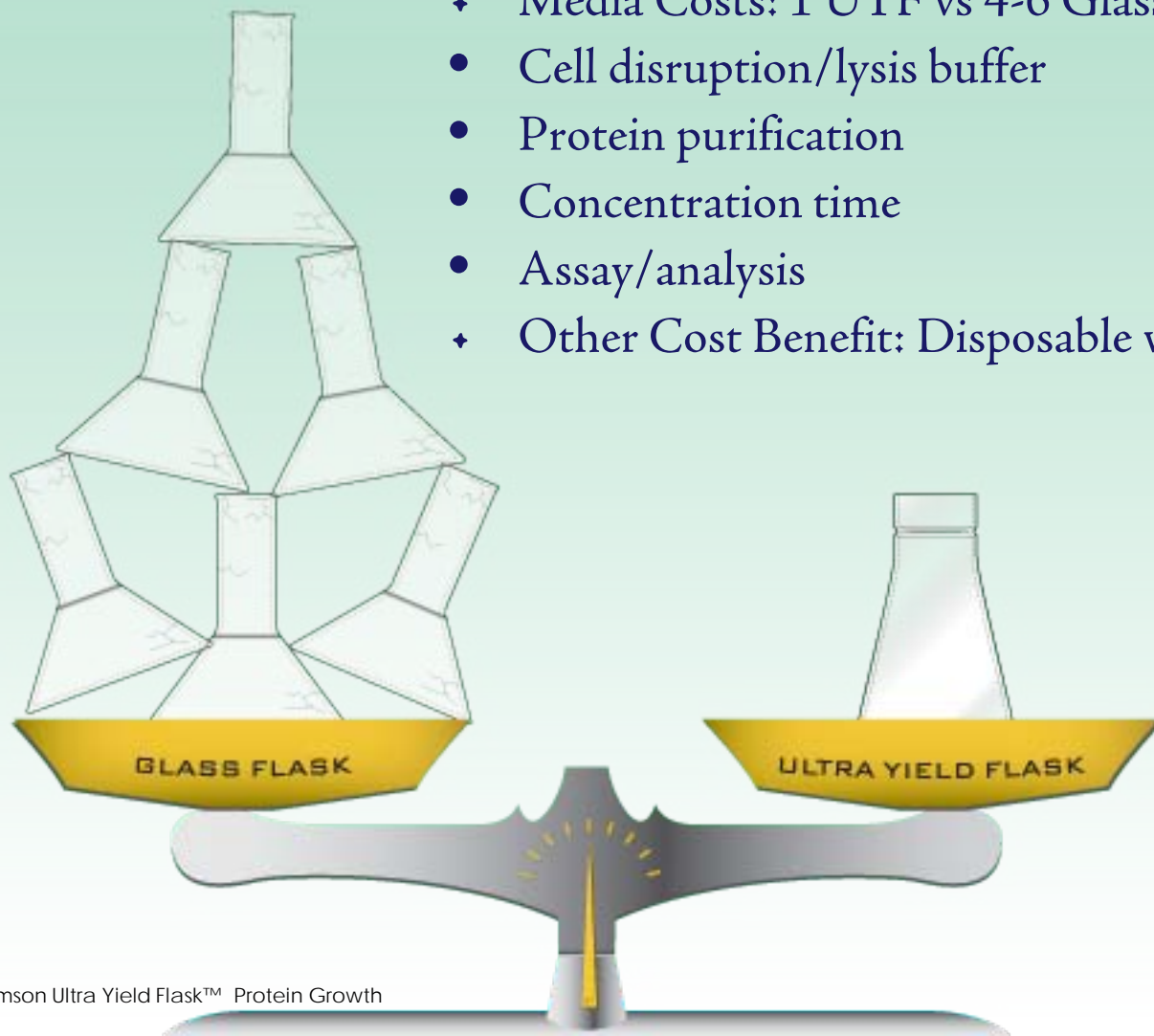
*Economic parallel protein expression screening and scale-up in *Escherichia coli*. Journal of Structural and Functional Genomics 2006 Jun;7(2):101-8. Epub 2006 Dec 23.

Cost Benefit Analysis for using Thomson Ultra Yield Flask™

Thomson Ultra Yield Flasks	Cost	Glass/Disposable Erlenmeyer Flasks	Costs
Media costs for UYF flasks	\$20.00	Media costs for Glass flasks	\$120.00
Cell disruption/lysis buffer	\$19.33	Cell disruption/lysis buffer	\$115.98
Protein purification	\$120.00	Protein purification	\$720.00
Assay analysis	\$100.00	Assay analysis	\$100.00
<i>Total cost to run</i>	\$259.33	<i>Total cost to run</i>	\$1,055.98

Cost Savings Comparison for Thomson UYF Protein Yields vs Old Methods

- Media Costs: 1 UYF vs 4-6 Glass/Erlenmeyer Flasks
- Cell disruption/lysis buffer
- Protein purification
- Concentration time
- Assay/analysis
- Other Cost Benefit: Disposable vs Reusable – (see next page)



Cost Benefit Analysis for Thomson Ultra Yield Flask™ Disposable vs Reusable

Ultra Yield Flasks Disposable	Cost	Reusable	Daily Cost of Cleaning
Thomson UYF™ 250mL	\$6.00	Water	\$1.58
		Electricity	\$2.24
		Hazardous waste water	\$15.80
		Labor	\$100.00
<i>Total cost to run</i>	\$6.00	<i>Total cost to run</i>	\$119.62

Common Microbes Expressed in the Thomson Ultra Yield Flask™

- *Escherichia coli*
- *Pichia*
- *Pseudomonas*
- *Schizosaccharomyces pombe*
- As well as other yeasts and microbes



What does this mean?

The Ultra Yield Flask™ offers a simple alternative to traditional shake flasks, and to complex small-scale (<10L) fermentation devices at minimal cost. Thomson Instrument Company, together with users at Genentech, GSK, and Pfizer, have validated the Ultra Yield Flask™ as a suitable system to achieve high-density cell fermentation. It is a disposable bioreactor.



Ultra Yield Flask Part Numbers:

Part Number	Item	Qty per case
931136-B	Ultra Yield Flask 2.5L	6
931154	Ultra Yield Flask 2.5L plus Cap	6
931147	Ultra Yield Flask 125mL	50
931144	Ultra Yield Flask 250mL	50
931141	Ultra Yield Flask 500mL	25
899414	AirOtop Seal 2.5L	100
899415	AirOtop Seal 125mL, 250mL and 500mL	100
899425	Enhanced AirOtop Seal for 2.5L	100
899424	Enhanced AirOtop Seal for 500mL	100
899423	Enhanced AirOtop Seal for 250mL	100
899421	Enhanced AirOtop Seal for 125mL	100