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Universal Rapid Clear® 96-Well Filter Plate: 15-Minute Lysate Clarification solution for intracellular proteins

Data provided by Leash Bio

Abstract

Thomson's new method provides a fast, efficient approach for clarifying cell lysates prior to intracellular protein purification. The Thomson Universal Rapid Clear® 96-Well Filter Plate offers a fast, standardized solution for processing up to 96 samples (2mL each) in as little as 15 minutes. Using a non-binding depth-filter matrix, it removes debris while preserving protein integrity across diverse hosts including insect cells, *E. coli* and mammalian expression systems. Optimized protocols for insect cells and *E. coli* demonstrate up to 2 hours of time savings and improved reliability, establishing the Universal Rapid Clear® Plate as a robust, automation-friendly tool for accelerated protein screening and downstream process development.

Introduction

Traditional clarification approaches such as centrifugation alone and sequential depth-filter steps, can be slow, variable, and difficult to automate at scale. The Universal Rapid Clear® 96-Well Filter Plate solves these issues with a standard ANSI/SLAS footprint that integrates into existing automation platforms and plate handlers. Its depth-filter design efficiently removes cells and debris while preserving protein integrity, making it well-suited to lysate clarification of intracellular proteins to support protein-expression studies and early downstream process development. As biopharma teams rely more heavily on robotic screening to shorten timelines, this format provides consistent, reproducible results across multiple samples with minimal method changes.

Product Features

- **Works with all intracellular lysates:** Insect cells (Sf9, *T.ni*), *E. coli*, CHO, & HEK293
- **Filtered lysates are ready for purification**
- **Clarifies up to 2 mL each well:** Supporting screening without the bottleneck of manually processing samples
- **Depth- filtration technology:** Effectively removes cells and particulates - no sequential filter steps, no risk of clogging, and minimal protein loss due to non-binding filter matrix
- **Automation-friendly:** Standardized (ANSI/SLAS format) footprint

Materials

Intracellular Protein Methods Centrifugation Method

1. Collect cells from expression system (*E. coli*, insect cells, etc.)
2. Evaluate cell density – transfer appropriate number of cells to centrifuge and pellet
3. Remove supernatant and gently resuspend pellet in appropriate amount of lysis buffer (reference Table 1)
4. Set centrifuge settings to RCF1 and centrifuge lysate sample at 4,000 x g for 10 minutes to pre-clear
5. Place filter plate (PN 921747) on top of collection plate (PN 931133)
6. Transfer up to 2 ml of pre-cleared cell culture supernatant to empty filter wells
7. Set centrifuge settings to RCF and spin at 336 x g RCF (340RPM) for 5 minutes
8. Remove filter plate and collect clarified samples
9. Measure protein concentration in clarified samples (Octet® (Sartorius), SDS-PAGE, HPLC/FPLC, etc.)
10. Purify via PhyTip® (Biotage), IMCStips® (IMCS) or other purification system

Cell type	Culture Density	Lysis buffer resuspension volume (volume Lysis buffer: original culture volume)
E. coli	3 x 10^9 cells/ml (~OD600 ≤ 3)	1:10 to 1:20
Insect Cells (Sf9, *T.ni*, etc.)	1.5 – 2.5 x 10^6 cells/ml	1:6 to 1:8

Table 1 – Recommended general ratio of volume of lysate to culture to prevent clogging

Case Study: Leash Bio

Leash

Intracellular protein lysate clearance method for Expression Systems or ATCC Sf9 cells

Materials

- Thomson 96-well Universal Rapid Clear® Filter Plate (PN 9251547)
- Thomson 96 well plate (PN 931568)
- Thomson Optimum Growth® 6-well plate (PN 931133)
- Beckman Coulter Avanti J Series

Procedure

1. 30mL cultures of *T.ni* cells (2 x 10^6 cells/mL at 98% viability; 30mL per well in Thomson Optimum Growth® 6-well plates; harvested 64-66 hrs. post-infection by ~2 VP/cell MOI) were pelleted and resuspended in 4mL of lysis buffer, transferred to Thomson 24-well collection plates and sonicated.
2. Plates were spun until large debris pelleted out at 4°C for 30 minutes at 4000 x g RCF in JS5.3 rotor using the Beckman Coulter Avanti® J Series.
3. Pre-wet membrane on Thomson 96-well Universal Rapid Clear® Filter Plate with 300ul equilibration buffer and spin to remove.
4. Crude clarified lysates were applied to the Thomson 96-well Universal Rapid Clear® Filter Plate and spun at 2500 x g RCF for 10 minutes.
5. Optical Clarity was successfully achieved after Universal Rapid Clear filtration of *T.ni* lysates.

6. HT 24-well format feeds into 96-well purification process. Proceeded with HT purification application using IMCS tips. Excellent performance with no issues encountered during purification.

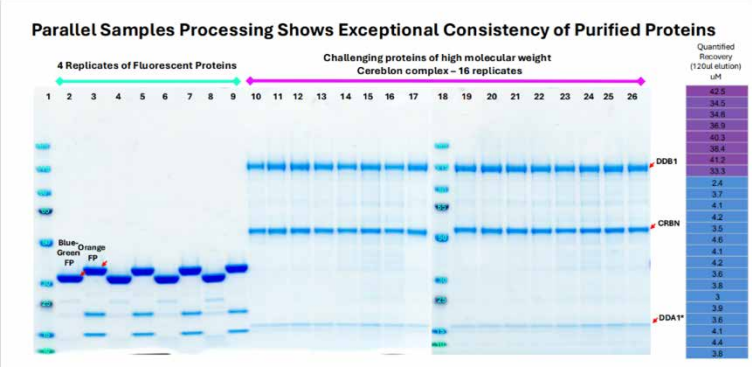

Figure 1 – Single-step purification from 8mL of insect cell lysate using IMCS affinity capture tips. 5% of purified protein run on 4-12% gel /MOPS buffer to illustrate purification quality.

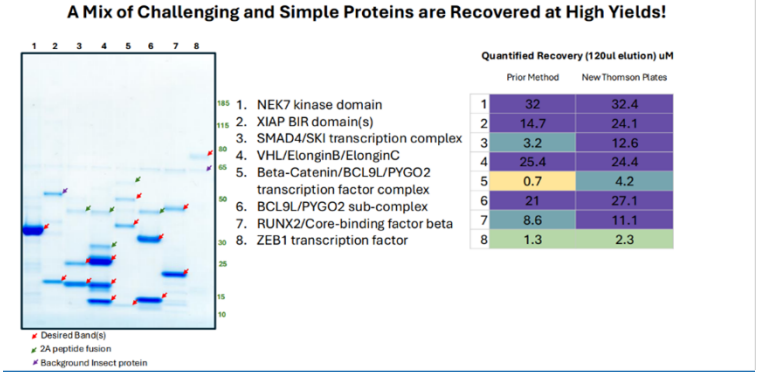

Figure 2 – Single-step purification from 8mL of insect cell lysate using IMCS affinity capture tips. 5% of purified protein run on 4-12% gel /MOPS buffer to illustrate purification quality

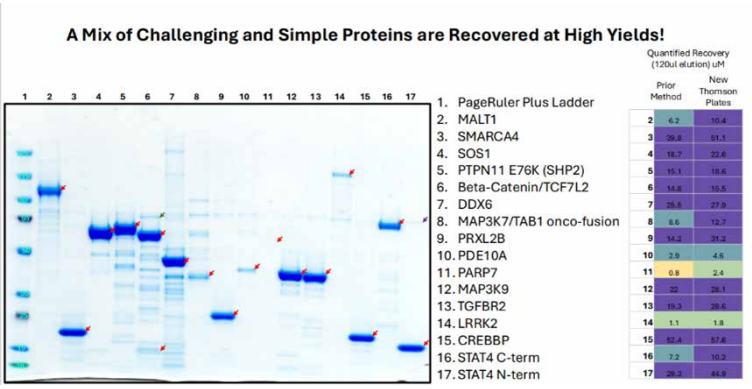

Figure 3 – Single-step purification from 8ml of insect cell lysate using IMCS affinity capture tips. 5% of purified protein run on 4-12% gel /MOPS buffer to illustrate purification quality.

Summary of Case Study

A common failure mode in tip-purification are poorly clarified/polished lysates being applied to affinity resins in tips.

This can lead to dirty purifications upon later evaluation and inconsistent volume recovery. As shown in Figures 1-3 (gel images from Leash Bio), SDS-PAGE resolved purified proteins were abundant and all yields were as expected. Protein titer and yield benefited from Universal Rapid Clear® Clarification. This quick and reliable method was reproducible for multiple intracellular proteins, illustrating its universal benefits.

Discussion

- Universal Rapid Clear® 96-well filter plates remove cellular debris and particulates.
- Complete clarification of lysates for multiple different intracellular proteins from *E. coli* or insect cells (Sf9 or *T.ni*) in only 15 minutes. This is a 2-hour savings over the standard processing time.
- Non-binding depth filter matrix for 90-95% recovery.
- Minimal variation between different lots of plates.
- Seamless integration with liquid handling systems – able to be used on deck to be later manually transferred to a collection plate and centrifuged.

Conclusion

The Thomson Universal Rapid Clear® 96-Well Filter Plate provides a faster procedure (15 minutes spin) solution for high-throughput clarification of cell lysates for intracellular proteins expressed in *E. coli*, insect cells, and mammalian cells, commonly used in biopharmaceutical development environments.

The plate's proven compatibility with multiple intracellular proteins, as well as standard antibodies, bi-specific, Multi-specific, fusion proteins, and antigens enables seamless integration into existing workflows, significantly reducing processing time. The Thomson Universal Rapid Clear® system supports accelerated development timelines while ensuring protein integrity and maintaining the quality standards required for biopharmaceutical applications.

For laboratories seeking to optimize their clarification workflow by two hours, reduce processing time, and improve throughput capacity, the Thomson Universal Rapid Clear® 96-Well Filter Plate represents a valuable advancement in sample preparation technology.

Acknowledgements

Thomson would like to thank the following contributors: Edward Kraft from Leash Bio, and other unnamed contributors for their conclusive data and general feedback included in this application note.

Notes

RCF: RCF (relative centrifugal force) also known as g-force (x g) is the force applied in relation to the sample. The radius of the centrifuge will determine the force which is dependent on radial length from axis to sample.

$$RCF = 1.18 \times R \times 1000/RPM$$

1. RPM is the number of revolutions per minute. This application note focuses on RCF rather than RPM. Machine-to-Machine, RCF is a more accurate measurement of force.
2. To avoid spilling it is recommended to apply a foil seal to the plates during centrifugation (Thomson PN 899405-1).
3. Flow though of lysate may not be very clear, however this will not affect the downstream purification procedures.

It is recommended to avoid clogging by testing optimal dilution and lysis conditions for your specific sample. Please contact your Thomson representative for any assistance (info@htslabs.com).

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Thomson Part Numbers

Well Plate	Part Number
96-Well Universal Rapid Clear® Filter Plate	921747
96-Well Plate	Square Well Round Bottom	931130-S
96-Well Plate	Square Well Pyramid Bottom	931133
Adhesive Foil Seal	899405-1

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