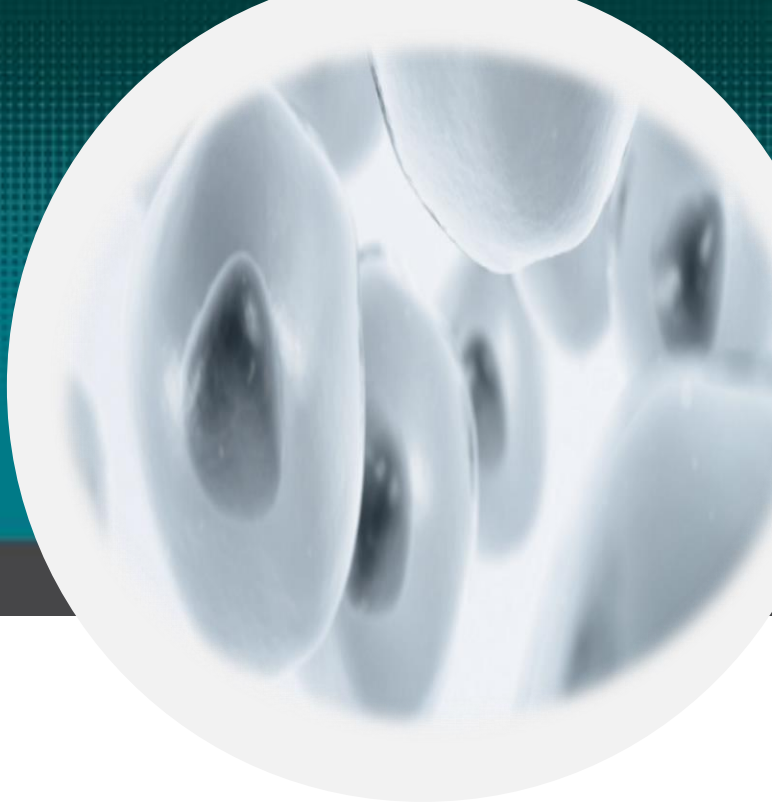
Microfluidics™

Application Note



Microlyser™ Technology for Production Scale Cell Disruption

INTRODUCTION

Cell disruption, the process of breaking open cells to release their intracellular contents, such as protein therapeutics, enzymes, and nucleic acids, is a critical process in various biological and biotechnology fields.

Unfortunately, traditional mechanical methods, such as sonication and bead milling, present many challenges. Whether working in lab, pilot or production scale, these methods face inconsistent shear rates, high number of passes for achieving desired results, heat regulation frustrations, difficult downstream processing, risk of contamination, extensive cleaning and repeatability issues.

THE HYBRID APPROACH

These issues can be more challenging on a larger scale since larger volumes can have more pronounced issues. To address these issues on a production scale, Microfluidics has introduced a new revolutionary approach.

Microlyser™ technology incorporates a patented electric pumping system with Microfluidics' exclusive fixed-geometry Interaction Chamber™ technology. The combination of these two techniques maximizes protein yields and ensures high product quality in cell disruption with reproducible results batch-to-batch.

Application Note

Microfluidics™

Microlyser™ Technology for Production Scale Cell Disruption

CASE STUDY

In collaboration with Tufts University (Medford, MA), Microfluidics conducted a case study with *E. coli* BL21 cells expressing green fluorescent protein (GFP). These cells were supplied by Tufts and processed on both the production scale MP350 Microlyser™ and the benchtop LM20 Microfluidizer® processor utilizing the same Interaction Chamber™ design (G10Z).

RESULT TAKEAWAYS

Both machines achieved similar cell lysis efficiencies as indicated by the OD600 (Absorbance at 600nm). The values were reduced by over 90% from the unprocessed *E. coli* sample with an OD600 of 1.73 to around or below 0.1 after just one pass (as shown in Table 1). Although not a direct measurement of rupture rate, the OD600 values are related to the number of cells and thus can provide an estimate of the percentage of cells lysed. After two passes, the OD600 dropped to ~.07 for both the MP350 and LM20 indicating more than ≥95% lysis.

The total protein assay is a more important quantification as it measures the amount of protein released upon lysing the cells. High protein recovery was achieved with both the MP350 Microlyser™ and the LM20 processor (as shown in Figure 2). The Microlyser™ processor achieved high total protein concentrations after just one pass.

These data demonstrated that the cell disruption process can be easily scaled up with the Microlyser™ processor.

Machine	Pressure	Passes	OD 600 (Absorbance)	Est Lysis %
		0	1.730	-
LM20	20,000	1	0.066	96.2%
		2	0.073	95.8%
		3	0.047	97.3%
	18,000	1	0.063	96.4%
		2	0.072	95.8%
		3	0.025	98.6%
	16,000	1	0.128	92.6%
		2	0.100	94.2%
		3	0.051	97.1%
MP350	20,000	1	0.139	92.0%
		2	0.07	96.0%
		3	0.072	95.8%

Table 1. Lysis Comparison Analysis of the LM20 Microfluidizer® and the MP350 Microlyser™ processors.

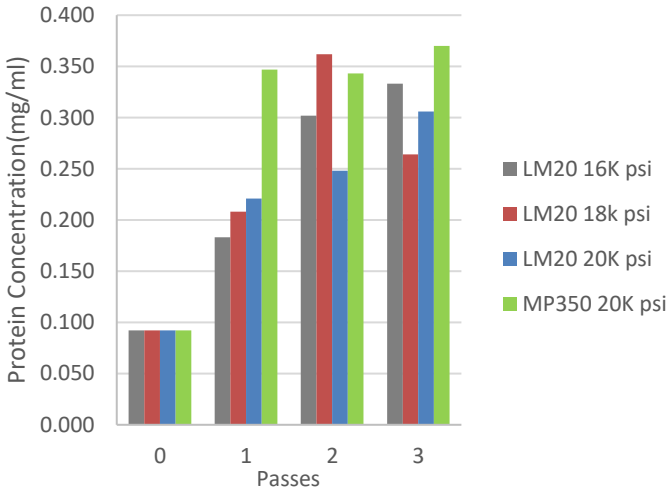


Figure 2. Protein Recovery comparisons between the LM20 Microfluidizer® and MP350 Microlyser™ processors