Microfluidics

Biopharmaceutical
CS-303-1

Case Study

Corixa Study Shows Microfluidizer® Processor Results Superior to those of Leading Homogenizer

Before being acquired by **GlaxoSmithKline**, biotechnology company **Corixa** (Seattle, WA) developed and produced an oil-water emulsion to be used as a vaccine adjuvant.

CHALLENGE

Corixa was not satisfied with the high particle size variability they received from a leading homogenizer, and the percentage of particles ranging above 200 nm made sterile filtration impracticable. After meeting with Microfluidics, Corixa realized it would be possible to reduce average particle size and tighten distribution with a **Microfluidizer high shear fluid processor,** which enables a uniform processing environment through its fixed-geometry interaction chamber. Therefore, Corixa undertook an in-depth study to evaluate results achieved on a Microfluidizer processor as compared to their existing environment.

OBJECTIVES

Corixa designed a comparative study to determine the ideal technology for processing the emulsion based on the following critical quality attributes:

- Average particle size
- Polydispersity
- Active concentration post-filtration

METHODS

Three batches of pre-emulsion material were produced and subsequently separated into halves for processing in each technology. After high pressure homogenization, sterile filtration was performed. Processed materials were analyzed using laser diffraction, an HPLC with fluorescence detector and a gradual pore plugging model.

RESULTS

The Microfluidizer processor demonstrated significant improvement in every critical quality attribute identified by Corixa, as summarized below.

Comparison of Critical Quality Attributes

Analysis conducted on average of three batches processed by each technology

	Leading Homogenizer	Microfluidizer Processor
Average particle size	**185 nm** after **15 passes** (best achieved)	**141 nm** after **3 passes**
Goal: < 150 nm	⊘	√
Polydispersity	**43.1%** above 200 nm	**0.51%** above 200 nm
Goal: < 10% above 200 nm	⊘	√
Active concentration post-filtration	**15%** loss of actives	**1%** loss of actives
Goal: < 2% loss of actives	⊘	√
Filter area required per liter of product	**640** cm^2	**17** cm^2
	The leading homogenizer required **38 times** more filter area than the Microfluidizer processor	

SUCCESS AT A GLANCE

Industry: Biopharmaceutical

Application: Vaccine adjuvant

Challenge: Reduce variability of particle sizes post-processing and enable effective sterile filtration

Objective: Compare Microfluidizer® processor to existing homogenizer

Methods: Three identical batches were processed by each technology

Key Results: The Microfluidizer processor outperformed the homogenizer in every critical metric:

- 50% smaller average particle size
- Significantly tighter distribution
- Negligible active loss post-filtration
- 38 times less filter area required

M-110EH-30 Microfluidizer processor

PRESENTED BY:

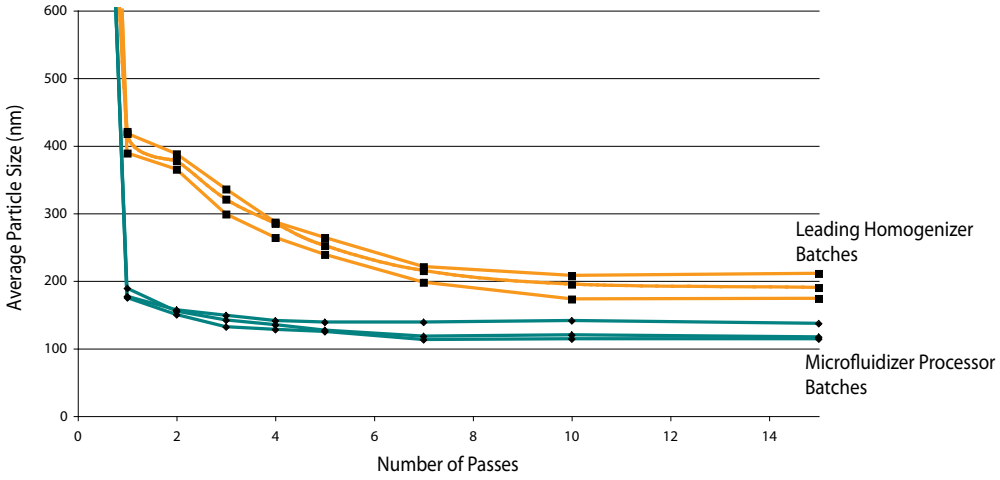
JEDD TAYLOR, CORIXA

Manufacturing our emulsion with the Microfluidizer processor at a pressure of 25,000 psi with the F12Y interaction chamber allows us to achieve the following:

- Desired average particle size of less than 150 nm
- Narrow particle size distribution
- High product yields
- Ability to sterile filter the product (avoid aseptic formulation)
- Stable emulsion

Average Particle Size and Polydispersity

As a function of homogenization method, operating pressure = 25,000 psi (1720 bar)

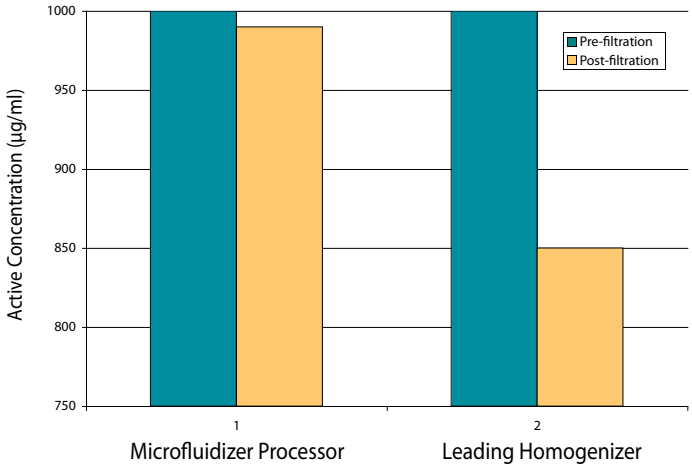


What the Data Show

The average particle size of the emulsion processed by the Microfluidizer processor was, on average, **50% smaller** than results achieved on the leading homogenizer. Further, the variance between batches was significantly tighter.

Active Concentration Post-filtration

Recovery of active after filtration, averaged across three batches



What the Data Show

Due to its fixed-geometry interaction chamber and uniform processing conditions, the Microfluidizer processor exhibited high repeatability and batches were characterized by a narrow particle size distribution – resulting in negligible active loss post-filtration. Conversely, batches processed on the leading homogenizer with wide variability were subject to significant active loss post-filtration.

CONCLUSIONS

Based on these data, along with product quality and process efficiency improvements, Corixa switched from their leading homogenization equipment to a Microfluidics-powered production environment.

Microfluidics

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