

Detergent Removal with Amicon[®] Microcon[®] and Centricon[®] Centrifugal Devices

Amicon Microcon and Centricon centrifugal devices are efficient laboratory tools for removing small molecules from solutions of proteins or nucleic acids. Often, the molecule to be removed is one of a number of commonly used protein solubilizing agents, or detergents.

The chemical nature of most detergents allows for micelle formation above a critical concentration limit (Critical Micelle Concentration, CMC). Micelle formation results in aggregation of the detergent and leads to gross changes in molecular structure. This affects the amount of the detergent that can be removed from a solution by Microcon and Centricon devices with specific molecular weight cut-off (MWCO) membranes.

For example, the monomer of Triton[®] X-100 has a molecular weight of 500-650 Daltons. Triton X-100 should pass readily through the 3,000 MWCO membrane in a Centricon-3 device. However, at concentrations above 0.01% (0.2 mM), Triton X-100 forms micelles composed of approximately 140 monomeric units. During ultrafiltration, the micelles behave like 70,000-90,000 Dalton globular proteins. Therefore, above the CMC of Triton X-100, a Centricon-100 concentrator (100,000 MWCO) would be required to remove the detergent effectively.

Detergent Analysis

In a series of studies, Millipore researchers used Total Organic Carbon (TOC) analysis, optical density or conductivity to measure detergent removal by Microcon and Centricon concentrators after just one centrifugation spin (note that complete detergent removal generally requires 3-5 spins). As the results in the table indicate, detergent removal depends both on the original detergent concentration and the MWCO of the Microcon and Centricon units. All measurements shown were made using detergent/distilled water solutions.

NOTE: Temperature, the presence of salts in the solution, and/or macromolecule/detergent interactions may lower the CMC for a particular detergent. Use the table only as a general guideline in assessing the efficiency of detergent removal with the Microcon and Centricon devices.



**Percent Detergent Removal After One Spin,
Centricon and Microcon Centrifugal Device Model**

Detergent		-3	-10	-30	-50	-100
SDS	0.01%	> 90%	> 90%	> 90%	> 90%	> 90%
	0.1%	> 90%	> 90%	> 90%	> 90%	> 90%
	1%	40-89%	40-89%	40-89%	40-89%	40-89%
	5%	< 40%	< 40%	< 40%	40-89%	40-89%
NaDeoxycholate	0.1%	> 90%	> 90%	> 90%	> 90%	> 90%
	1%	> 90%	> 90%	> 90%	> 90%	> 90%
	5%	40-89%	40-89%	40-89%	> 90%	> 90%
CAPS	5%	> 90%	> 90%	> 90%	> 90%	> 90%
CPCI ¹	0.01%	> 90%	> 90%	> 90%	> 90%	> 90%
	0.1%	40-89%	40-89%	40-89%	40-89%	40-89%
	1%	< 40%	< 40%	< 40%	< 40%	40-89%
	5%	< 40%	< 40%	< 40%	< 40%	40-89%
TDMABr ²	0.1%	> 90%	> 90%	> 90%	> 90%	> 90%
	1%	< 40%	< 40%	< 40%	40-89%	> 90%
	5%	< 40%	< 40%	< 40%	< 40%	> 90%
Digitonin	0.01%	> 90%	> 90%	> 90%	> 90%	> 90%
	0.1%	40-89%	40-89%	40-89%	40-89%	40-89%
	1%	< 40%	< 40%	< 40%	< 40%	< 40%
Tween [®] -20	0.01%	< 40%	< 40%	40-89%	40-89%	> 90%
	0.1%	< 40%	< 40%	< 40%	40-89%	> 90%
	1%	< 40%	< 40%	< 40%	< 40%	40-89%
	5%	< 40%	< 40%	< 40%	< 40%	< 40%
Triton X-100	0.01%	40-89%	40-89%	40-89%	40-89%	> 90%
	0.1%	< 40%	< 40%	< 40%	< 40%	> 90%
	1%	< 40%	< 40%	< 40%	< 40%	40-89%
	5%	< 40%	< 40%	< 40%	< 40%	< 40%
CHAPS	0.1%	> 90%	> 90%	> 90%	> 90%	> 90%
	1%	40-89%	40-89%	> 90%	> 90%	> 90%
	5%	< 40%	< 40%	40-89%	> 90%	> 90%

¹Cetylpyridinium chloride

²Tetradecyltrimethylammonium bromide

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