Common Questions about Extraction Studies on Plastic Components Used In Biopharmaceutical Manufacturing Following USP <665>

Kurt Moyer, Ph.D.

President, Pine Lake Laboratories

Let's face it, performing extractions studies on biopharmaceutical single use systems and components following USP <665> stinks (professionalism prevents a stronger expletive). The study design is labor intensive, presents multiple analytical challenges and can be expensive. Unfortunately, it is not optional. If manufacturers of single-use systems and components want to sell their products into the biopharmaceutical and biotech industries, they must perform an extraction study following USP <665>. The biopharmaceutical and biotech customers (and their regulators) will be expecting it.

To help a manufacturer of single-use systems and components prepare to execute the USP <665> extraction study, below are the answers to four common questions.

Question 1: How are the extraction conditions determined?

In **Section 2 Table 1** of USP <665> is a list of 17 different types of manufacturing components along with the required extraction times. The

extraction time for most components is one day 1, aseptic connectors are extracted for 7days and components that are intended to be used during drug product storage are extracted for 21 days.

In **Section 4.2.1** of USP <665> are listed the following 3 solvents to be used in the extraction study:

- Solution C1 (50% ethanol)
- Solution C2 (acidic solution, pH 3)
- Solution C3 (basic solution, pH 10)

For all component types, the extraction temperature is 40˚C.

Question 2: How much sample is required?

The number of samples required is based upon the number of solvents and time points. So for a typical study using the three extraction solvents and one time point, at least three samples are required. For small components, larger sample numbers may be required to ensure sufficient volume of sample extract to complete all of the required extractables analysis.

Question 3: Should the sample be pretreated?

This depends on the intended use of the single use system component. If the end user will be provided specific instructions on how to clean and prepare the component for use, then these same steps should be taken before starting the extraction study. If no such instructions will be provided to the customer, no washing or cleaning of the sample should be done before starting the extraction study.

Question 4: Does the size and shape of the sample matter?

The ratio of the sample's surface area to the volume of extraction solvent () should target a ratio of 6:1 cm^2/mL. The size and shape of the single use system component will impact how closely this target ratio can be met.

In addition, the extraction studies are performed on a laboratory scale. Large components may require the creation of representative samples to be used in the extraction study or creative collaboration with the client in performing the extraction of the full scale sample.

About the Author

Kurt L. Moyer has more than 40 years of pharmaceutical and medical device development experience spanning all areas from discovery support to marketed products. His primary expertise is in the areas of extractables and leachables, method development and validation, identification of impurities and metabolites, and GLP/GMP compliance. Prior to joining Pine Lake Laboratories, Dr. Moyer served as a Senior Research Investigator for Sanofi Aventis and a Research Scientist for the DuPont Pharmaceutical Company. Dr. Moyer received his Ph.D. in biochemistry from Villanova University.



Copyright © 2026 Pine Lake Laboratories

This document is the property of Pine Lake Laboratories and is for Pine Lake Laboratories purposes only. Unless given prior approval, it shall not be reproduced, circulated or quoted, in whole or in part, outside of Pine Lake Laboratories, its committees and its members.

Cite as: Pine Lake Laboratories. October 2026. Common Questions about Extraction Studies on Plastic Components Used In Biopharmaceutical Manufacturing Following USP <665>. Pine Lake Laboratories, Bristol CT