ThermoFisher SCIENTIFIC

The way forward in rapid sterility testing.

Pharma analytics

SteriSEQ Rapid Sterility Testing System

applied biosystems

Confidently accelerate cell therapy manufacturing with simple, rapid sterility testing

In-process testing for bacterial and fungal contaminants

In the context of cell therapy production, rapid sterility testing plays a crucial role in enabling the quality and safety of the final product. The fast-paced nature of this production process, coupled with the limited shelf life of cell therapy products, necessitates the early detection and prevention of further contamination throughout the workflow. By implementing rapid sterility testing, potential sources of contamination can be uncovered and promptly addressed. This proactive approach helps mitigate the risk of product loss and unexpected production delays, ultimately enhancing workflow efficiency. Moreover, it preserves the integrity and efficacy of the cell therapy product, further bolstering its overall quality.

The Applied Biosystems™ SteriSEQ™ Rapid Sterility Testing System is a real-time PCR (qPCR) solution designed specifically for rapid sterility testing of cell therapy products.

This integrated system combines a commercially available qPCR assay kit with widely used qPCR instruments and dedicated analytical software, enabling accurate and efficient contaminant detection while helping facilitate regulatory compliance.

- Actionable qPCR results in less than 5 hours
- A single-well, multiplexed assay that detects both bacterial and fungal contamination
- An efficient qPCR workflow solution, including security, audit, and e-signature (SAE)–compatible software
- A global network of regulatory and field application specialists for support, from method development and implementation to validation

The SteriSEQ Rapid Sterility Testing System provides actionable results in less than 5 hours, helping ensure product safety and quality.

SteriSEQ Rapid Sterility Testing System

Incorporated into the cell therapy bioproduction workflow, the SteriSEQ Rapid Sterility Testing System provides a valuable complement to the time-consuming culture-based test, enabling accurate and actionable results in less than 5 hours. Backed by technical and regulatory support, the SteriSEQ system can help accelerate and simplify sterility testing for both raw material and in-process testing.

Easy qPCR workflow delivers results in <5 hours

The SteriSEQ Rapid Sterility Testing System is a qPCR solution that simplifies the integration of sterility testing into your manufacturing process. It includes trusted Applied Biosystems™ qPCR systems, accompanied by dedicated analytical software that can help facilitate regulatory compliance. The SteriSEQ system workflow offers a straightforward and user-friendly approach to contaminant detection. To enable seamless functionality and system-wide integration, all components of the system are internally tested and validated to perform together.

Prepare sample	Set up reaction	Run qPCR	Analyze
			
	SteriSEQ Rapid Sterility Testing Kit	QuantStudio 5 or 7500 real-time PCR system	AccuSEQ Real-Time PCR Detection Software
~2.5 hours	Real-time PCR: ~1.5–2.5 hours		

Designed to help support recommended qualification guidelines

qPCR-based testing offers an additional level of scrutiny to standard growth-based sterility testing methods and can be applied as a rapid risk assessment tool in the measurement of bacterial and fungal DNA in test samples.

Able to provide quick results when time is critical, the SteriSEQ Rapid Sterility Testing Kit assays can offer early detection of potential contamination events when used for raw material or in-process testing.

The SteriSEQ system is designed to support recommended qualification guidelines from regulatory bodies:

- International Council for Harmonisation (ICH)
- United States Pharmacopeia (USP)
- European Pharmacopoeia (Ph. Eur.)
- Japanese Pharmacopoeia (JP)

Regulatory guidelines

USP <71>: This sterility testing is used to determine the absence of viable microorganisms in pharmaceutical products, medical devices, and other sterile products to ensure their safety and quality.

USP <1071>: It is widely recognized that the current growth-based sterility tests with an incubation period of at least 14 days are not suitable for products with a short shelf-life or for products prepared for immediate use, which are usually infused into patients before the completion of the test. These short-life products include … cell and gene therapies, which require a new generation of risk-based approaches that include rapid microbial tests. [1]

1. United States Pharmacopeia (2023). General Chapter, <1071> Rapid microbial tests for release of sterile short-life products: A risk-based approach. USP-NF. Rockville, MD: United States Pharmacopeia.

Accurate, fast contamination detection to help ensure product safety

The SteriSEQ system is centered around its robust, probe-based qPCR assay. The SteriSeq assay leverages the high performance of gold-standard Applied Biosystems™ TaqMan™ chemistry and has the capability to detect more than 16,000 bacterial species and 2,600 species of fungi.* It can accurately detect cell densities of up to 1 x 10^6 cells, without any cross-reactivity to impurities resulting from in-process production. The multiplexed assay is designed to test for both bacteria and fungi in a single well, which offers several benefits, such as ease of use, improved workflow efficiency, and preservation of materials that can be used in the final product. Furthermore, the kit leverages multiple channels for detection, including a discriminatory positive control that can help differentiate a control-based contamination versus a true positive sample.

- **Fast**—delivers actionable results in less than 5 hours, enabling contamination detection of in-process and raw materials, which helps expedite the release of your cell therapy product
- **Sensitive**—detects bacterial and fungal species at 5–25 genome copies per reaction
- **Specific**—designed specifically for bacteria (16S rRNA) and fungi (18S rRNA) with no known cross-reactivity to in-process byproducts or sample matrix effects
- **Efficient**—minimizes use of sample material by simultaneously testing for bacteria and fungi, preserving precious cells for the final product
- **Accurate**—a discriminatory positive control helps eliminate false positives, and an internal positive control helps ensure PCR reaction consistency in the samples

Table 1. Partial panel of species detected by the SteriSEQ kit.

Aspergillus brasiliensis	*Staphylococcus aureus*	*Burkholderia cepacia*
Candida albicans	*Lactobacillus acidophilus*	*Ralstonia pickettii*
Bacillus subtilis	*Lactobacillus delbrueckii*	*Cryptococcus neoformans*
Clostridium sporogenes	*Niallia circulans*	*Komagataella pastoris*
Pseudomonas aeruginosa	*Afipia felis*	

The SteriSEQ Rapid Sterility Testing Kit includes:

- Applied Biosystems™ 2X Master Mix Plus
- Applied Biosystems™ SteriSEQ™ Assay Mix
- Applied Biosystems™ SteriSEQ™ Discriminatory Positive Control
- Applied Biosystems™ SteriSEQ™ DNA Dilution Buffer

* Based on *in silico* testing.

Simplicity, interactivity, and speed—choose your qPCR system

With more than 25 years of innovation behind their design, our qPCR systems deliver true value with excellent performance, reliability, and world-class support. The following two instruments have been internally validated with both the SteriSEQ kit and AccuSEQ software, helping ensure a smoother pathway to process qualification and validation.

QuantStudio 5 Real-Time PCR System

A high-performance benchtop instrument, the QuantStudio 5 system is designed for users who need excellent performance and security options in a qPCR system, but also need one that's affordable and easy to use. The pharmaceutical analytics system of the QuantStudio 5 instrument is optimized for use with our specialized analytical test kits for contamination and impurity testing of biological materials produced in cell culture. The QuantStudio 5 system also offers built-in software features for electronic record security and the prevention of unauthorized instrument access to assist with 21 CFR Part 11 compliance.

7500 Fast Real-Time PCR System

An established qPCR workhorse, the 7500 Fast system is a powerful platform for labs that require reliable performance with minimal investment. The 7500 Fast platform features an innovative optical system that enhances sensitivity and lets you access a broader range of fluorophores. An advanced multicomponent algorithm minimizes spectral cross-talk, providing excellent performance for our multiplexing analytical assay kits. Additionally, the optional SAE package helps meet 21 CFR Part 11 compliance requirements.

Table 2. Comparing qPCR systems.

	QuantStudio 5 Real-Time PCR System	7500 Fast Real-Time PCR System
Format	96-well; 0.1 mL	96-well; 0.1 mL
Sample ramp rate	3.66°C/sec	± 2.2°C/sec
Sensitivity	1 copy detection, 1.5-fold differences in target quantity (singleplex reaction)	
Dynamic range	10 logarithmic units	9 logarithmic units
Optical detection/multiplexing	6 decoupled filters, up to 6 targets/well	5 excitation filters, up to 5 targets/well
SAE package	Included	Optional
Dimensions (H x W x D)	40 x 27 x 50 cm	49 x 34 x 45 cm
Display	Touchscreen	None
Connectivity	Wi-Fi enabled	None

Streamlined data interpretation for fast and accurate results

AccuSEQ Real-Time PCR Software offers efficient and streamlined data interpretation for analyzing contaminants and impurities in various testing scenarios. Serving as a pivotal element within an all-encompassing solution, AccuSEQ software equips you with actionable results crucial for biopharmaceutical manufacturing processes.

- Optimized and validated for SteriSEQ assays
- Available for QuantStudio 5 and 7500 Fast qPCR systems
- SAE capabilities to enable 21 CFR Part 11 compliance
- Complete traceability with assay-specific output, eliminating manual calculations
- Comprehensive data management and reporting features
- Integrated, easy-to-use interface allows for consistency across multiple data applications

Sterility testing using AccuSEQ software

- **Automated analysis**—advanced algorithms for automated calling were developed using data interpretation guidelines for SteriSEQ assays; automated analysis tools enable one-click processing of SteriSEQ assay data, helping deliver presence or absence calls within seconds of data collection being completed (Figure 1)
- **In-depth data review**—AccuSEQ software offers easy-to-use manual review tools, including a complete table of C_t values as well as amplification, multicomponent, and raw data plots (Figure 2)
- **Regulatory compliance**—SAE capabilities included with AccuSEQ software help enable 21 CFR Part 11 compliance

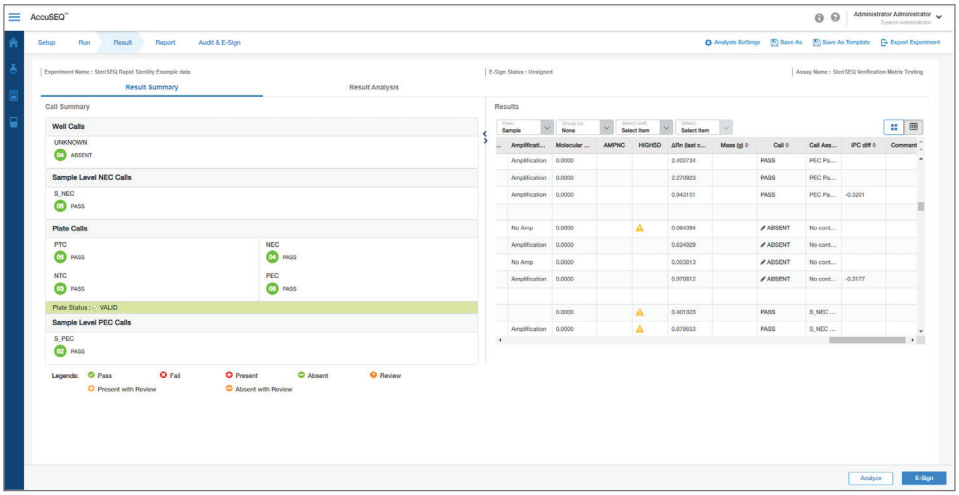

Figure 1. Example of automated presence and absence calls.

Amplification plot (ΔRn vs. cycle)

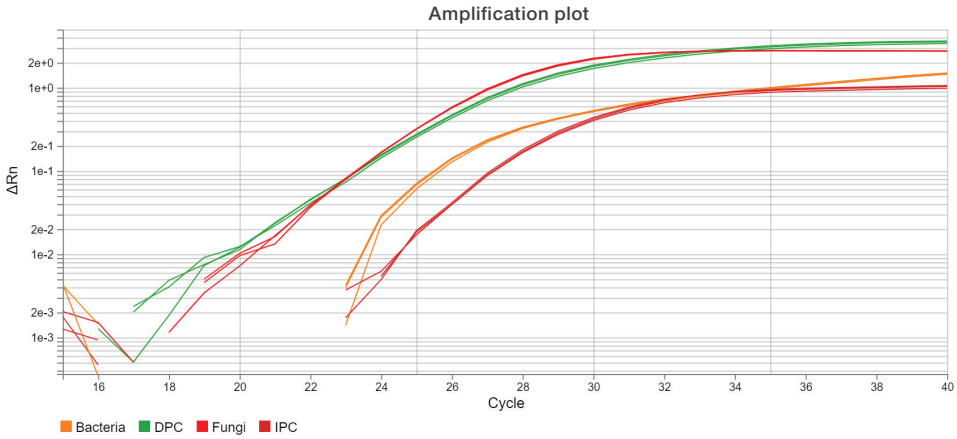

Figure 2. Example of manual review tools.

Qualify with ease—use with success

To help ensure seamless integration into your lab, from initial process development and system implementation to validation and routine use, we can collaborate with your team to develop a comprehensive testing implementation plan.

This can include:

- Instrument installation with installation qualification (IQ)/operational qualification (OQ)
- Computer system validation (CSV)
- Method/protocol optimization
- Regulatory consulting and support
- Process validation guidance
- System and application training

Benefit from worldwide implementation and support

Our distribution and service network, composed of highly trained support and application personnel, reaches 150 countries on 6 continents.

Ordering information

Description	Cat. No.
SteriSEQ Rapid Sterility Testing Kits	
SteriSEQ Rapid Sterility Testing Kit (100 reactions)	A57185
SteriSEQ Rapid Sterility Testing Kit (50 reactions)	A57186
qPCR systems	
QuantStudio 5 Real-Time PCR System, 96-well, 0.1 mL, w/tower (Pharmaceutical Analytics)	A31672
7500 Fast Real-Time PCR System, w/tower (QST)	4365463
Data analysis	
AccuSEQ Real-Time PCR Detection Software v3.2 (for QuantStudio 5 system)	A58643
AccuSEQ Real-Time PCR Detection Software v2.2 (for 7500 Fast system)	A58642

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