

# Container Closure Integrity: Regulations, Test Methods, Application

## Regulatory Requirements

### Instructors

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CONNECTING  
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- Introduction
  - Your name and company
  - Your position and how it relates to CCI
  - Goals and expectations for the short course
- Group Discussion (VoC)
  - What are the needs and pain you experienced?
  - How can this course help you?

## **Food and Drug Cosmetic Act**

- **1962 Amendments added CGMP provision, Section 501 (a) (3)**

**“A drug ... shall be deemed to be adulterated if... its container is composed, in whole or in part, of any poisonous or deleterious substance which may render the contents injurious to health**

## The Regulations:

- 21 CFR § 600.11 (h)

After filling, sealing shall be performed in a manner that will maintain the integrity of the product during the dating period. In addition, final containers and closures for products intended for use by injection shall be sterile and free from pyrogens.

- 21 CFR § 211.94 (b)

Container closure systems shall provide adequate protection against foreseeable external factors in storage and use that can cause deterioration or contamination of the drug product.

- US FDA (1999). Guidance for Industry: Container Closure Systems for Packaging Human Drugs and Biologics
  - It requires suitability of the selected container closure system be sufficiently established in the four key aspects: protection, safety, compatibility and performance.
  - Container closure integrity is considered an essential part of suitability, especially in the aspect of protection against microbial contamination, reactive gases (e.g. oxygen) and moisture.
  - A container closure system that permits penetration of microorganisms is unsuitable for a sterile product.

- ICH Q8(R2) (2009) Pharmaceutical Development
  - The choice of materials for primary packaging should be justified. The discussion should describe studies performed to demonstrate the integrity of the container and closure. A possible interaction between product and container or label should be considered.
- US FDA (1994). Guidance for Industry for the Submission Documentation for Sterilization Process Validation in Applications for Human and Veterinary Drug Products
  - Study designs should simulate the stresses of the sterilization process, handling, and storage of the drug and their effects on the container-closure system.
  - Container-closure integrity should be demonstrated on product units that have been exposed to the maximum sterilization cycle(s). If a product is exposed to more than one process, then exposure to the maximum cycle of all processes should be incorporated into the study design. The studies must be described and included in the submission to gain regulatory approval.

## US FDA (1994). Guidance for Industry for the Submission Documentation for Sterilization Process Validation in Applications for Human and Veterinary Drug Products

For initial validation of microbiological integrity of container-closure systems, product sterility testing is not normally considered sufficient. Container closure integrity testing methods and results should be summarized to demonstrate the integrity of the microbiological barrier.

The ability of the container-closure system to maintain the integrity of its microbial barrier, and, hence, the sterility of a drug product throughout its shelf life, should be demonstrated. ... As previously stated, sterility testing at the initial time point is not considered sufficient to demonstrate the microbial integrity of a container-closure system. Documentation of the sensitivity of the container-closure integrity test should be provided.

The sensitivity of the experimental method used for container-closure integrity testing should be specified and provided.



# Manufacturing Batch CCI Evaluation

**EU Guideline to Good Manufacturing Practice (2008).** Medicinal Products for Human and Veterinary Use, Annex 1. Manufacturer of Sterile Medicinal Products.

Current wording:

117. Containers should be closed by appropriately validated methods. Containers closed by fusion, e.g. glass or plastic ampoules should be subject to 100% integrity testing. Samples of other containers should be checked for integrity according to appropriate procedures.

Proposed wording:

8.18 Containers should be closed by appropriately validated methods. Containers closed by fusion, e.g. Form-Fill-Seal Small Volume Parenteral (SVP) & Large Volume Parenteral (LVP) bags, glass or plastic ampoules, should be subject to 100% integrity testing. Samples of other containers should be checked for integrity utilising validated methods and in accordance with QRM, the frequency of testing should be based on the knowledge and experience of the container and closure systems being used. A statistically valid sampling plan should be utilized. It should be noted that visual inspection alone is not considered as an acceptable integrity test method.

8.20 The container closure integrity validation should take into consideration any transportation or shipping requirements.

**US FDA (2004).** Guidance for Industry Sterile Drug Products Produced by Aseptic Processing — Current Good Manufacturing Practice

For drug products produced by aseptic processing, US FDA cGMP guidance requires any damaged or defective units should be detected, and removed, during inspection of the final sealed product.



- US State Food and Drug Administration (2008). Container and Closure System Integrity Testing in Lieu of Sterility Testing as a Component of the Stability Protocol for Sterile Products
  - US FDA promotes container and closure system integrity (CCI) testing as a component of the stability protocol for sterile products.
  - The guidance recommended CCI testing on stability in lieu of traditional end-of-shelf-life sterility testing for better sterility assurance, especially continued sterility of a drug product.
  - The guidance requires stability CCI testing methods be appropriately validated.
- ICH Q5C Guidance for the industry “Quality of Biotechnological products: Stability testing of Biotechnological / Biological products”
  - Sterility testing or alternatives (e.g. container closure integrity testing) should be performed at a minimum initially and at the end of the proposed shelf-life.



**<1207> Package integrity evaluation – Sterile products**

**<1207.1> Package Integrity in the product life cycle - Test method selection and validation**

**<1207.2> Package integrity leak test technologies**

**<1207.3> Package seal quality test technologies**

(Official date: August, 2016)

**PDA Technical Report 27 (TR 27) : Pharmaceutical Package Integrity**  
(currently being revised)



# PDA TR27 Revision

(tentative contents – Jan 2017)

- 1.0 INTRODUCTION
- 2.0 RISK ASSESSMENT
- 3.0 PACKAGE INTEGRITY THROUGH PRODUCT LIFECYCLE
- 4.0 PACKAGE INTEGRITY AND MAXIMUM ALLOWABLE LEAKAGE LIMITS
- 5.0 DECISION TREE
- 6.0 TEST METHOD SELECTION
- 7.0 CHALLENGES
  - 7.1 Challenges with Package Design
  - 7.2 Challenges with Methodologies
- 8.0 EMERGING TECHNOLOGIES
- 9.0 FUTURE CONSIDERATIONS
  - 9.1 On-line testing
  - 9.2 Sampling considerations
  - 9.4 Other considerations
- 10.0 GLOSSARY OF TERMS
- 11.0 BIBLIOGRAPHY

Courtesy of Donald Signer PDA TR 27 Revision Team Leader



# Course Outline

- **Container Closure Integrity: Regulations, Test Methods, Applications**

**Part 1. Introduction**

**Part 2. Test methods**

- **Part 3. Test method development and validation**
- **Part 4. Test method selection and application**



# Instructors' Perspective: What We Can Deliver

- **A scientific foundation** for understanding and applying various CCIT technologies
  - Working principles, advantages and disadvantages
  - Technical considerations for method selection
  - Application case studies
- **A risk-based approach to** applying CCIT throughout product life cycle
  - CCI data package during development, validation, routine manufacturing
  - Key considerations for developing testing requirements, study design, method selection, and sampling plan
- Method development and validation **best practices**
  - **Focus:**
  - **Enable you to make sound technical decisions to support business needs**



# Instructors' Perspective: What We Can NOT Deliver

- “What hole size do I need to detect?”
- A one-size-fits-all or ideal CCIT technology that is capable of covering all CCI testing needs
- A decision tree or cheat sheet for method selection, sampling plan