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Aseptic processing of health care products —

Part 1: General requirements

Traitement aseptique des produits de santé —

Partie 1: Exigences générales

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Contents

Page

Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 198, *Sterilization of health care products,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 204, *Sterilization of medical devices,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 13408-1:2008) which has been technically revised. It also incorporates ISO 13408-1:2008/Amd 1: 2013.

The main changes are as follows:

— a complete restructuring of the document;

— inclusion of a diagram to explain the relationship between the ISO 13408 series and ISO 18362;

— revision of the normative references;

— alignment of definitions with ISO 11139:2018;

— positioning of the document to recognize current and future advances in sterile manufacturing technology, acknowledging that new approaches to aseptic processing are transforming classical aseptic processing;

— promotion of aseptic processing principles and the systematic implementation of quality risk management (QRM), including for aseptic process design, and microbiological contamination and particulate contamination control;

— provision of guidance for different types of aseptic processing, for example, manual processing systems to automated robotic processing systems;

— deletion of tables from the previous edition of this document referring to acceptance criteria for process simulation (media fill) qualification and requalification;

— encouraging adoption of advanced aseptic processing technologies and continuous process improvement to improve assurance of sterility;

— recognition that alternative or rapid microbiological methods (RMMs) provide timely microbiological data vital for process monitoring and control, and for product release;

— inclusion of a series of informative annexes providing guidance on defining an aseptic process, including risks to be considered, aseptic processing areas (APAs), classification of cleanrooms, aseptic process flow, closed systems and robotics, and qualification of a cleanroom clothing system.

A list of all parts in the ISO 13408 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Wherever possible, health care products intended to be sterile should be terminally sterilized in their final sealed container by a terminal sterilization process, which has been validated to achieve a specified sterility assurance level (SAL). ISO/TC 198 has developed standards for terminal sterilization of health care products, for example (but not restricted to): the ISO 11137 series (radiation sterilization), ISO 17665-1 (moist heat sterilization), ISO 20857 (dry heat sterilization), ISO 11135 (ethylene oxide sterilization) and ISO 14160 (liquid chemical sterilization).

Where a health care product is intended to be sterile and cannot withstand terminal sterilization in its final container, aseptic processing provides an acceptable alternative for product manufacture.

ISO/TC 198 also developed ISO/TS 19930, which provides guidance on aspects of a risk-based approach to assuring sterility of terminally sterilized, single-use health care product that is unable to withstand processing to achieve maximally a 10^{-6} SAL.

Aseptic processing produces a sterile product in its final container by the assembly of component parts (e.g. product, container and container closure) that have been sterilized separately by validated and controlled processes suitable for each component part. Each of these assembly processes can introduce error that can result in product contamination. Furthermore, contamination can be introduced from the personnel, equipment or environment when the sterilized components are brought together to create the final product. It is important to control all possible sources of contamination so that the aseptic manufacturing process maintains sterility of previously-sterilized components during product filling or assembly, and sealing. Fundamentally, aseptic processing minimises the probability of a chance event of microbial contamination occurring. The rationale to use aseptic processing is product dependent and is not based solely on manufacturing considerations.

Examples of applications in which aseptic processing is used include:

— aseptic handling and filling of solutions, suspensions, semisolids and powders;

— aseptic handling, transfer and packaging of solid products including solid medical devices;

— aseptic handling, transfer and packaging of combination products;

— aseptic handling of tissues or biological production systems (e.g. vaccines).

Sterilization processes for product and components used as a prerequisite for aseptic processing are established and validated separately to aseptic processing activities.

Traditionally, aseptic processing has been carried out in cleanrooms and associated controlled environments to provide an environment in which the air supply, materials, equipment and operators are regulated to maintain sterility of previously-sterilized components. Advances in aseptic processing include systems that prevent the direct intervention of operators with open-product containers or exposed-product contact surfaces in the critical processing zone, for example, the use of fully enclosed barrier systems (e.g. isolators), automation and robotics. This can mean that a traditional cleanroom is not always appropriate for aseptic processing activities.

To provide assurance of sterility for an aseptically processed product, this document identifies three key activities in the development and operation of an aseptic process to reduce and control particulate and microbial contamination risks:

— process design;

— risk assessment;

— contamination control strategy (CCS).

An effective risk management approach is an essential tool for the development, validation and control of aseptic processing. Only when risks of particulate and microbiological contamination have been

identified, and where possible eliminated, or minimized and controlled, can an aseptic process be considered suitable for its intended purpose.

Controls for some infectious agents, e.g. protozoa or parasites, can require a multifaceted approach to assure component or product safety. These types of infectious agents are not considered in the ISO/TC 198 standards for terminal sterilization or aseptic processing. Guidance can be found in ISO 18362 applicable good manufacturing practice (GMP) regulations and the EDQM guide[28].

This document describes the fundamental requirements of aseptic processing regardless of the nature of the aseptic process, e.g. small-scale versus large-scale, open- versus closed-processing, single-use, disposable sterile systems, traditional cleanroom versus isolator systems, manual versus automated or robotic systems, autologous sterile products, processes with post-aseptic lethal treatments and processes using real-time microbiological monitoring. It does not, however, describe the requirements for other manufacturing processes upstream or downstream of aseptic processing activities. This document acknowledges the different geographical regulatory approaches to aseptic processing and recognizes that new approaches to aseptic processing are transforming classical aseptic processing. It recognizes that future improvements in aseptic processing rely on improved use of technology for both existing and new products, for example, sterile advanced therapy medicinal products.

To encourage adoption of suitable, advanced aseptic processing technologies and continuous process monitoring, this document introduces the concept of recognising efforts in risk-based process design, particulate and microbiological contamination control and risk management, to justify consideration of alternative approaches to demonstrating ongoing process effectiveness, for instance reduced frequency of requalification, sampling, or for real-time release of finished product.

Assurance of sterility for an aseptically processed product should not be confused with the term, ‘sterility assurance level (SAL)’. SAL is a mathematical extrapolation applicable only to a validated and controlled terminal sterilization process of known microbial lethality and which is delivered to each individual sealed unit of product subject to that process. Due to the variability and chance nature of occurrence of microbial contamination during aseptic processing, aseptic process simulation (APS) does not result in a mathematical probability of there being a single, viable microorganism in a contaminated unit, but rather results in an indication of what can happen in the routine processing of subsequent product batches (see ISO/TS 19930:2017, Clause 4).

This document specifies the requirements for general aspects of aseptic processing of health care products. Requirements and guidance for other processes often employed during aseptic processing are specified in ISO 13408-2 to ISO 13408-7, i.e. sterilizing filtration (ISO 13408-2), lyophilization (ISO 13408-3), clean-in-place (CIP) technologies (ISO 13408-4), sterilization in place (SIP) (ISO 13408-5), isolator systems (ISO 13408-6) and alternative processes for medical devices and combination products (ISO 13408-7).

ISO 18362 specifies the minimum requirements for, and provides guidance on, a risk-based approach for the processing of cell-based health care products (CBHPs) requiring control of viable and non-viable microbial contamination. It is applicable to CBHPs labelled ‘sterile’, as well as to those that are not labelled ‘sterile’. For aseptic processing of CBHPs to be labelled sterile, ISO 18362 refers normatively to this document and ISO 13408-7. A CBHP that incorporates non-sterile starting material cannot meet the ISO 11139 definition of aseptic processing, which amongst other things, requires the use of sterile product and components. ISO 18362, therefore also includes requirements and guidance for the processing of such products to reduce and control microbial contamination risks.

The relationship between the ISO 13408 series and ISO 18362 is shown in Figure 1.

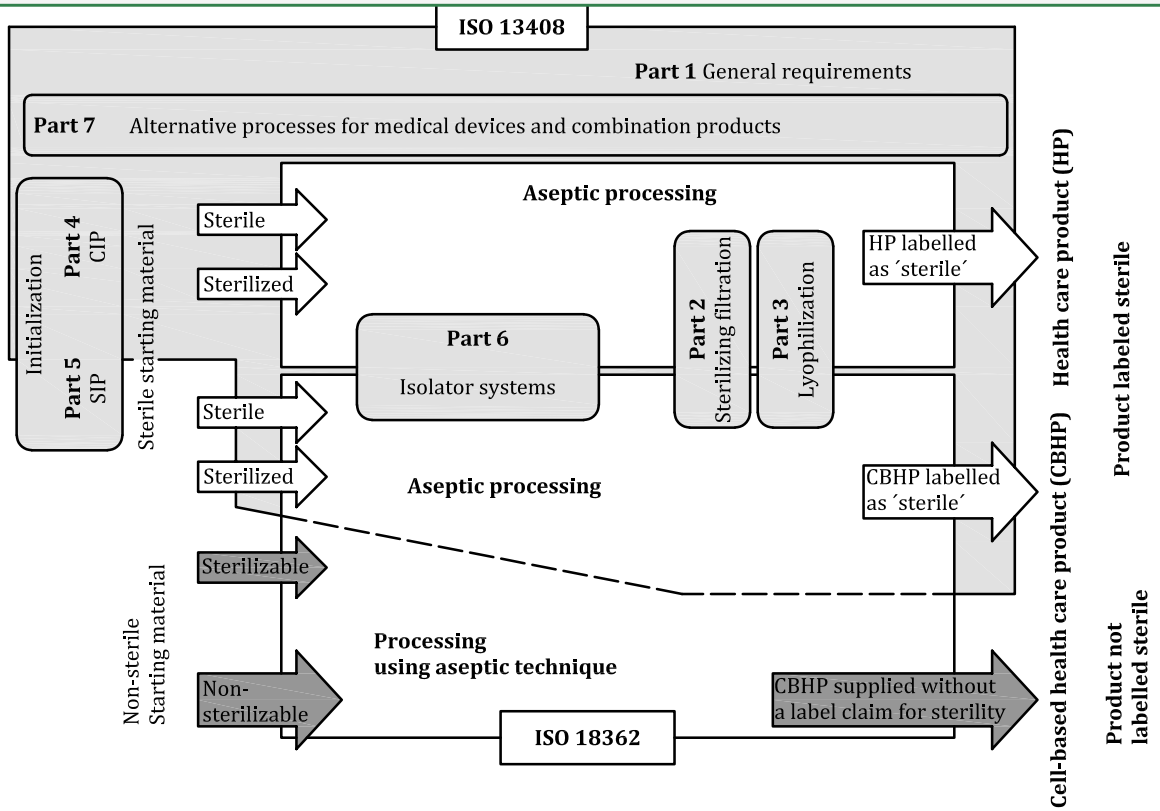

Figure 1 — Relationship between the ISO 13408 series and ISO 18362