

CLEANING OF COMPOUNDING ASEPTIC ISOLATORS (CAIS) AND CLASS II BIOLOGICAL SAFETY CABINETS (BSCS)

Overview

Compounding Aseptic Isolators and Class II biological safety cabinets are used in hospital pharmacies and other dispensing facilities to formulate (i.e. “compound”) individual prescriptions for patient care. A typical hospital pharmacy utilizing a CAI for contamination control and sterility, will make individual pharmaceutical preparations that are transferred aseptically into vials, intravenous (IV) bags, syringes, infusion devices, etc. These are termed compound sterile preparations (CSPs) in the industry. By contrast, a licensed compounding facility, utilizing a Class II biological safety cabinet for containment, contamination control and sterility, might produce cancer treatment drugs in batches of perhaps tens or a few hundred.

Both CAIs and Class II BSCs are used to physically isolate manufactured products from contamination from the background environment — the room outside the isolator. Some form of cleaning and surface sanitization of these separate enclosures is required to prevent cross-contamination from one CSP to the next. Further, cleaning of these devices at the beginning of each shift is required according to local and/or European guidelines. Hereafter is described how to best clean and disinfect CAIs and Class II BSCs. We will refer to both of these as CAIs or isolators for the remainder of this document.

Cleaning and Disinfecting CAIs

The cleaning and disinfection activities for CAIs will be separated into cleaning and disinfecting the CAI at the beginning of each shift and cleaning and sanitizing the interior of the CAI between CSPs. Much of the literature on isolator cleaning refers to the need for “low-linting” fabrics that do not shed. However, little guidance is provided as to which fabric types are best. The lint that is shed from wiping or mopping materials is made up of loose fibers that are not bound to the fabric surface or that are broken free during the cleaning process. Cleaning and disinfecting solutions can promote this linting or shedding activity if inappropriate fabrics are used.



A wide variety of fabrics can be fashioned into wipers or mops for use in cleaning isolators. Of these choices, only polyester knit fabrics have the requisite cleanliness, low particle and fiber counts, low endotoxin levels, low extractable residues, durability, and chemical compatibility that are needed for the cleaning and disinfection of CAIs. Further, polyester knit fabrics can be sterilized by autoclaving or by gamma irradiation to a Sterility Assurance Level (SAL) of 10⁻⁶ without loss of structural stability. The characteristically low levels of releasable particles and fibers associated with polyester knit fabrics are especially important in aseptic applications since it is well known that particles are potential carriers of bacteria. It is recognized that some facilities will consider that blended fabrics of polyester-cellulose may suffice for CAIs. If such fabrics are used within the isolator, the pharmacist should recognize that they do carry a risk of higher particle and fiber release onto the isolator surfaces.

Sterile polyester knit wipers are used before production to clean the isolator and during production to clean up spills, wipe down gloves (when wetted with sterile 70% isopropyl alcohol (IPA)), or to provide clean work surfaces. These wipers can be wetted with detergents to clean the isolator, deionized water or 70% IPA to remove cleaning agent residues, disinfecting agents to disinfect the isolator and deionized water or 70% IPA to remove disinfectant residues. Pre-wetted sterile wipers, containing 70% IPA are also available for these activities.

Cleaning and disinfecting the CAI at the beginning of each shift

Since the isolator is most often cleaned and disinfected while closed, to maintain the sterility of the isolator, sterile cleaning and disinfecting consumables — wipers, pre-wetted wipers, mops, cleaning/disinfecting agents, water, 70% IPA, etc. — must be introduced through an appropriate transfer device. Even if a facility’s Standard Operating Procedure (SOP) calls for the isolator to be opened for cleaning and disinfection, the use of sterile wipers and pre-wetted wipers is recommended, since they can be introduced into the isolator for in situ cleaning needs. This also eliminates the confusion of having both sterile and non-sterile wipers on hand and eliminates the need to sterilize wipers prior to use within the isolator.

The usual sequence for cleaning and disinfection includes a cleaning step, a rinsing step, a disinfecting step, another rinsing step and if needed, a gaseous sterilization step. As a side note, wipers can be used to wipe down any hard surface articles that are introduced into the transfer device for use within the isolator. This will remove surface contaminants that might otherwise compromise disinfection or sporicidal treatments.



I. Cleaning

To ensure that each shift begins in a pristine environment, it is necessary to clean the CAI to remove any residues and soils produced from the prior shift's activity. These contaminants, if not removed, would otherwise unnecessarily consume disinfectant and mitigate its application. Typically, small flat surface mops known as isolator cleaning tools, wipers, swabs and detergents are most commonly employed for these cleaning applications. Detergent selection is based on the type of soil to be removed. The detergent is applied to the surface using quarter-folded wipers with linear overlapping strokes, wiping from clean areas to dirty, renewing the wiper surface after each stroke. Wipers are used for all surfaces within arm's reach. Isolator cleaning tools are used for surfaces beyond arm's reach. Detergents also have the benefit of reducing the bioburden level on the surface; this lessens the task somewhat for the subsequent disinfection step.

II. Rinsing Following Cleaning

After cleaning, detergent residues are removed from the surfaces with wipers or mops that have been wetted with sterile deionized water or sterile 70% IPA. This will ensure that disinfectants have the opportunity to contact bare surfaces. Surfaces are considered clean when devoid of visible surface contaminants. Verify visually that the last wiper used to wipe down the surface is also devoid of visible residues.

III. Disinfection

The same procedures are followed for disinfection, except that liquid disinfecting agents are substituted for detergents. Disinfecting agents can include phenolics and quaternary ammonium compounds. Aqueous mixtures of IPA will provide some measure of disinfection, but they are ineffective against spores. Occasionally, liquid sterilants such as sodium hypochlorite (bleach), peracetic acid and hydrogen peroxide will be substituted for disinfectants when sporicidal activity is needed. These sterilants can be corrosive to surfaces and are therefore used intermittently.

IV. Rinsing Following Disinfection

The same procedure is followed here as in section III above. Disinfecting agent residues are wiped from the surface with wipers or isolator cleaning tools that have been wetted with sterile deionized water or sterile 70% IPA. This will eliminate the build-up of residue deposits that become difficult to remove in subsequent cleaning operations, and that will cause staining of work surfaces.

V. Gaseous Sterilization

Once the cleaning and disinfection steps are completed, if required, the isolator can be sterilized, with a suitable sterilant such as Vaporized Hydrogen Peroxide (VHP). The Quality Supervisor determines which cleaning and disinfecting steps are required for any given circumstance.

Cleaning and sanitizing the interior of the CAI between CSPs

To avoid cross contamination between CSPs, the accepted procedure is to wipe the counter or "deck" of the isolator with a wiper wetted with 70% IPA. Pre-wetted wipers are most convenient for this task. This will remove any residues from the work surface and will provide a measure of surface sanitization as well. IPA is a versatile cleaning agent and will remove many different types of soils. Some residues may only be water soluble, so in those cases, wipers wetted with water for injection (WFI) should be used to remove the surface soils.

A final wipedown with IPA will leave the surface clean for the next CSP. A second IPA-wetted wiper should be used to wipe down gloved hands to guard against cross-contamination in the preparation of the next CSP. If the CAI is used for compounding hazardous drugs, then swab sampling of the interior surfaces with subsequent analysis may be appropriate to prove that the compound of interest is not present at levels which would constitute an exposure limit danger.