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## **Stop Fighting Your CACI: Why a BSC Is the Better Choice for HD Compounding**

In sterile compounding, the choice of primary engineering control (PEC) directly influences workflow, safety, compliance, and long-term operational efficiency. While compounding aseptic containment isolators (CACIs) are sometimes selected for hazardous drug (HD) compounding, often due to perceived containment advantages (think magic box), their limitations can create significant challenges that compounders may not anticipate.

In contrast, Class II A2 Biological Safety Cabinets (BSCs) from reputable manufacturers consistently demonstrate superior usability, maintainability, and adaptability for both HD and non-HD sterile compounding. The goal of this month's newsletter is to

illustrate why BSCs remain the optimal choice for most compounding pharmacies.

## **Ergonomics and Workflow: BSCs Enable Better, Safer Technique**

One of the most significant differences between BSCs and CACIs is the user interface—specifically, whether the device uses glove ports.

BSCs allow direct hand entry (with proper PPE, of course), which:

- improves ergonomics compared with the rigid glove ports of a CACI
- enhances compounding dexterity and precision
- reduces fatigue during extended compounding sessions
- allows more natural hand movements that promote consistent first air protection



CACIs, on the other hand, inherently limit fine motor skills. The glove port interface creates physical and tactile separation between the compounder and critical sites, making aseptic technique more difficult to execute and sustain. This reduced dexterity can negatively impact both sterility assurance and operator confidence.

### **Material Transfer Challenges: CACIs Create Bottlenecks**

CACIs require the compounder to carefully manage material movement, especially when multiple components or supplies are needed.

- Staff must transfer all materials at once.
- Reentering the CACI requires replacing sterile gloves placed over the CACI gloves each time the hands are removed.

These extra steps interrupt workflow and create unnecessary delays. This means every forgotten syringe, misplaced vial, or additional diluent results in lost time and wasted materials. Over the course of a shift or across multiple staff members, these small inefficiencies add up in

both labor hours and supply usage.

BSCs eliminate these constraints because items can be brought in and out following established first air and airflow-preservation practices. The result is a smoother, more intuitive workflow that supports accuracy and productivity.

### **Maintenance, Certification, and Long-Term Reliability**

Maintenance and certification are areas where BSCs typically outperform CACIs—both in complexity and cost.

BSCs:

- are widely used across health-care settings, including sterile compounding, research labs, and hospital pharmacies
- have an established support network for parts, service, and every 6-month certification
- benefit from standardized, well-understood certification and testing procedures through NSF-49
- often remain reliable for 20+ years when sourced from reputable manufacturers



## CACIs:

- require additional, more complicated testing, such as ingress/egress verification
- are known for more difficult maintenance due to glove ports, seals, and interlocking chambers
- may experience delays in repairs or part acquisition—especially when manufacturers are less common
- have slower airflow velocity, even when ISO 5 is maintained, which can result in slower particle clearance times

## Competency Testing and Training

CACIs significantly complicate the aseptic manipulation competency assessment. In particular:

- Gloved fingertip and thumb testing for initial donning and post-media-fill testing must be performed inside the CACI.
- Staff must be trained to test themselves within the CACI.
- This creates opportunities for inconsistency and user error.

In contrast, BSCs simplify competency testing because:

- Gloved fingertip and thumb testing after garbing is conducted in the room where gloves are donned.
- Observers can easily administer post-media-fill gloved fingertip and thumb testing.
- Training aligns with standard USP <797>/<800> workflows familiar across the industry.

Simplified training reduces burden on trainers, improves consistency, and supports faster onboarding.

## Environmental Monitoring and Viable Sampling Burden

CACIs typically require more environmental monitoring because both the main chamber and the transfer chamber must be sampled.

- CACI users must take one air and one surface sample in each chamber.
- This results in double the samples required for a BSC in many situations.
- Troubleshooting excursions become more complex and resource-intensive.



BSCs, in contrast, often need only one air and one surface sample unless there is equipment in the device that should be sampled because of touch-contamination risk.

### **Decontamination, Cleaning, and Disinfection: Complexity Matters**

CACIs introduce substantial challenges in daily cleaning and disinfection:

- The design includes cracks, crevices, glove port interfaces, and chamber transitions.
- Effective cleaning of the inside front of the unit often requires opening the CACI, which compromises containment.
- This adds time, increases handling risk, and complicates SOPs.

BSCs, by comparison:

- have smoother surfaces
- are easier to access
- do not require full sash openings for the daily cleaning that compromise containment
- offer faster, more reproducible cleaning workflows

This ease of maintenance directly supports contamination control—every day.

### **Conclusion: BSCs Provide Safer, Simpler, More Efficient Compounding**

While CACIs may initially seem attractive due to perceived containment or because a facility has already purchased one, the operational consequences are significant:

- restricted ergonomics
- challenging material transfer
- complex maintenance and certification
- more demanding environmental monitoring
- difficult staff competency validation
- increased cleaning burden

BSCs mitigate all these issues while remaining fully compliant with USP standards and maintaining robust containment when used with proper CSTDs and PPE.

When given the option, compounders should choose a high-quality Class II A2 BSC over a CACI for HD sterile compounding. It improves safety, workflow, staff satisfaction, and long-term reliability—making it the smarter, more sustainable investment.



## QUESTION of the MONTH

I had a technician who was preparing individual syringes, and, when they laid them down on the mat to take pictures, they did not have a needle attached. How do we explain that this is an issue?

This practice results in an open container that is at greater risk of contamination. There are also aseptic challenges when picking up the syringe. It is best that all syringes laid down to take pictures must contain a capped needle.



### Pure Primer: Sterile Compounding and Handling Hazardous Drugs Live Training.

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### best practice makes perfect

Your sterile compounding operation may need to go beyond the chapter to satisfy specific state requirements. Read the laws, identify the gaps, and implement the best practices for your workflow.

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Abby Roth, founder of Pure Microbiology, has been supporting the testing and consulting needs of the pharmaceutical, medical device, and compounding industries since 2004. Her background in pharmaceutical microbiology includes extensive knowledge of environmental monitoring. Abby also has participated in multiple microbial excursion investigations, providing guidance on contamination sources and remediation options.