

Applying Aseptic Compounding Standards to protect patients and employees

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“Some problems are so complex that you have to be highly intelligent and well informed just to be undecided about them.”

Dr. Laurence J. Peter
1919-1990

Risk of Exposure

- Billions of compounded doses prepared annually by pharmacists and other clinicians
- CSPs prepared under controlled conditions (pharmacists) and uncontrolled conditions (on the ward) by nurses and physicians

Risk of Exposure

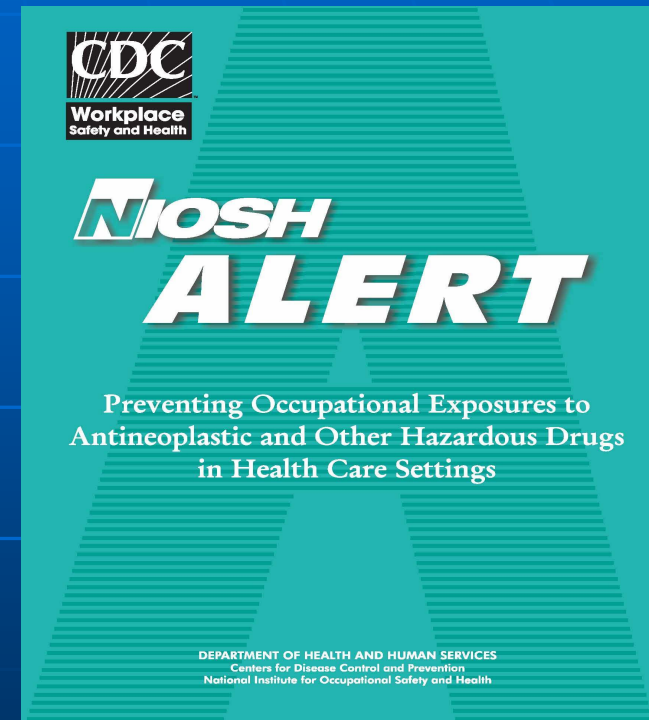
- Various chemical entities being manipulated under both controlled and uncontrolled conditions
 - Old or known agents
 - Non-hazardous
 - Hazardous
 - New or not yet developed agents

Risk of Exposure

- As the number of cancer and other chronically ill patients increases, the use of drugs to treat these diseases will grow, resulting in a greater potential for exposure of the health care worker

Composition of Hazardous Drugs

- Approximately *140 hazardous drugs* identified (NIOSH, 2004)
- Two-thirds are antineoplastic drugs
- Remainder are: antivirals, immunosuppressants, and monoclonal antibodies (MAbs)



Composition of Newer Agents

- Colony stimulating factors
- Growth factors
- Hormones
- Interferons
- Interleukins
- Monoclonal antibodies for therapeutic use
- Gene therapy products

Principles of Safety

- CSPs (compounded sterile preparations) supplied to patients are fit for their intended use and do not place patient at risk
 - *Quality Assurance of Aseptic Preparation Services, 4th ed. AM Beaney*
 - *Control of Substances Hazardous to Health-SI 1657*
 - *US USP Chapter <797> Pharmaceutical Considerations: Sterile Preparations*
 - *NIOSH Hazardous Drug Alert-US DHHS*
 - *PIC/S Guide to Good Practices for Preparation of Medicinal products in pharmacies (PE-010-1 (Draft 2))*

Principles of Safety

- Intended Use
 - Product quality (“5 Rights”)
 - Right Patient, Right Medication, Right Dose, Right Time and Right Route
- “Protect the product”
 - Sterility of compounded sterile preparation (CSP) through various methods
- “Protect the worker”

Word about Safety

- The advent of monoclonal antibodies offers abundant potential benefits to diagnosis and therapy of many conditions.
- Antibodies, including monoclonals, react with antigens which may be represented on tissues other than those to which they were raised.
- In the absence of well-defined cause/effect relationships between toxicity (theoretical or real) and agent, complacency that a given product is safe is ill-advised.

Hierarchy of Control

- Administrative Controls
- Engineering Controls
- Personal Protective Equipment
- Work Practice Controls

Administrative Controls

- Program Evaluation
 - Operational Risk Assessment and Gap Analysis
 - Change the way work is done to reduce exposure
- Policies and Procedures
 - Must consider all involved workers: receiving and handling, storage, preparation, administration, patient care, waste, housekeeping

Administrative Controls

- Implement Work Practices
 - Define and implement appropriate use of equipment and supplies
 - Policies and procedures
 - Quality Assurance activities
 - Restrict drug prep to a limited number of trained individuals using appropriate equipment
 - Educate and validate knowledge and competency
 - Control access to preparation area

Engineering Controls

- Primary and Secondary Controls
- Filtration: use and efficacy of HEPA filters
- Airflow: Adequacy and type
- Exhaust: Total, partial, recirculation
- Air Pressurization: Positive or Negative
- Containment: Enclosure type

Engineering Controls

- Primary and Secondary Controls
 - Primary Controls (Grade A air)
 - Laminar Flow Hoods (Horizontal or Vertical)
 - Biological Safety Cabinets
 - Secondary Controls (Grade B, C & D air)
 - Cleanrooms
 - Anterooms

Primary Engineering Controls



Laminar Air Flow
Workbench



Biological Safety
Cabinet



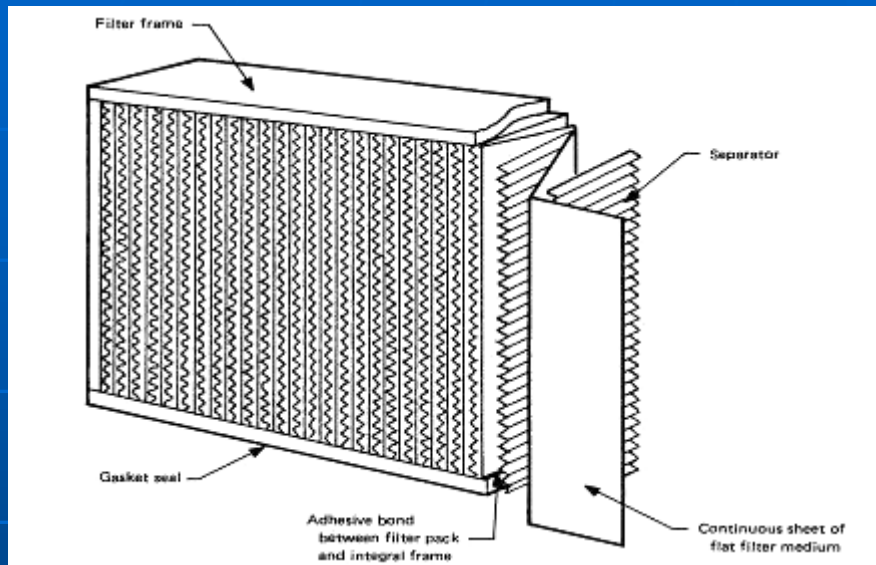
Barrier Isolator

Secondary Engineering Controls

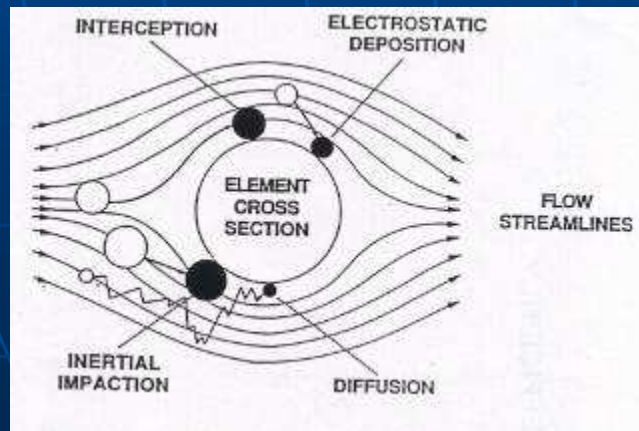


Cleanroom housing primary engineering controls

Engineering Controls



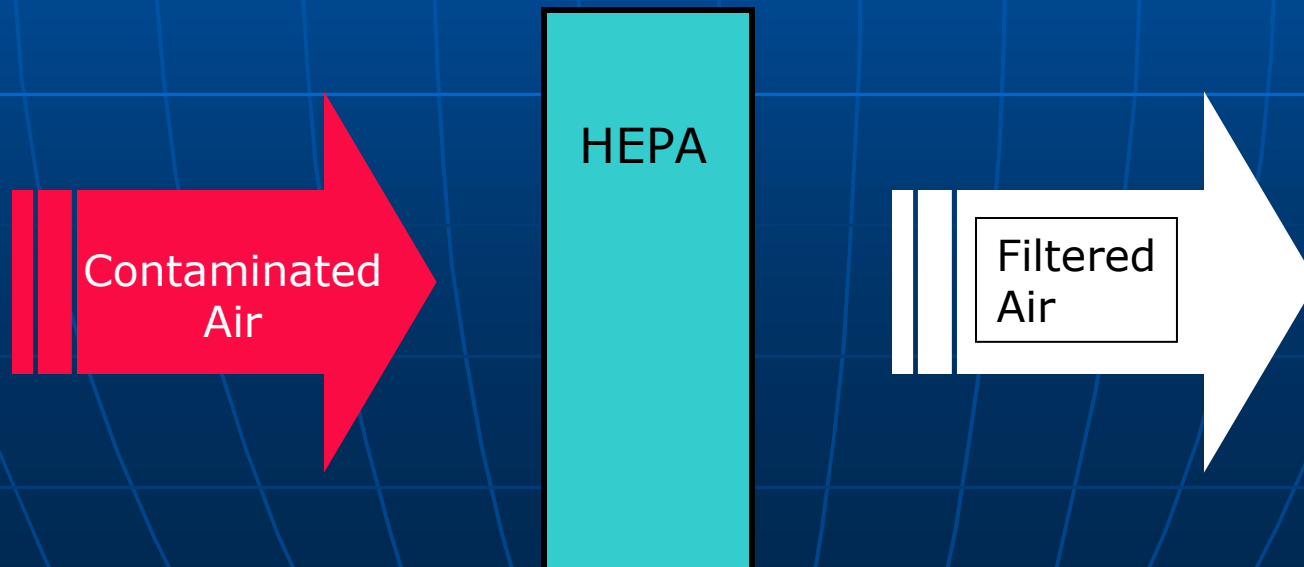
The HEPA filter is a particulate filter, retaining airborne particles and microorganisms, however gases pass freely through the filter.



HEPA filters retain particulate matter by multiple mechanisms working together.

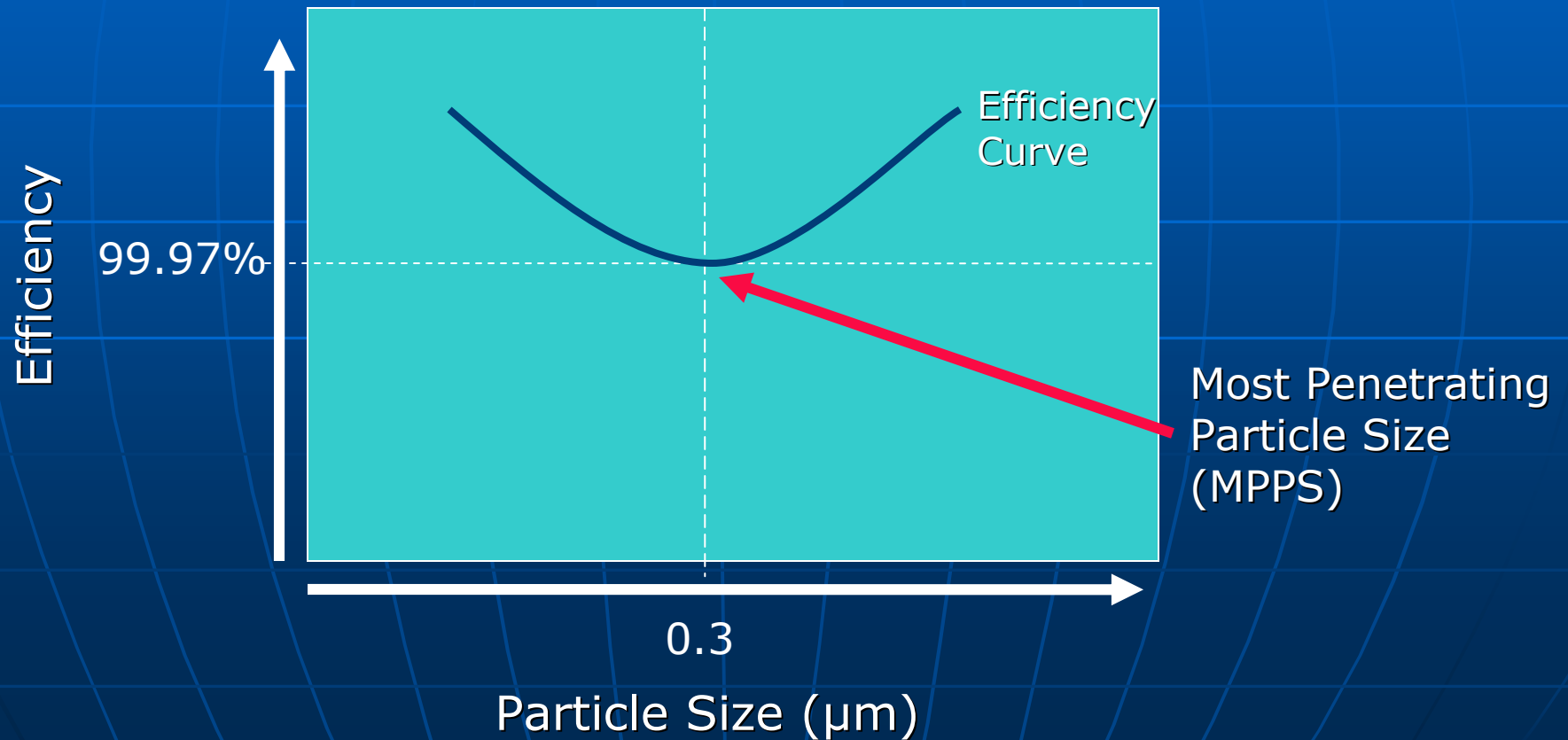
Engineering Controls

- Mechanics of HEPA filtration
- HEPA filtration
 - HeHePA Air
 - ≥ 99.97% efficient at 0.3 micron



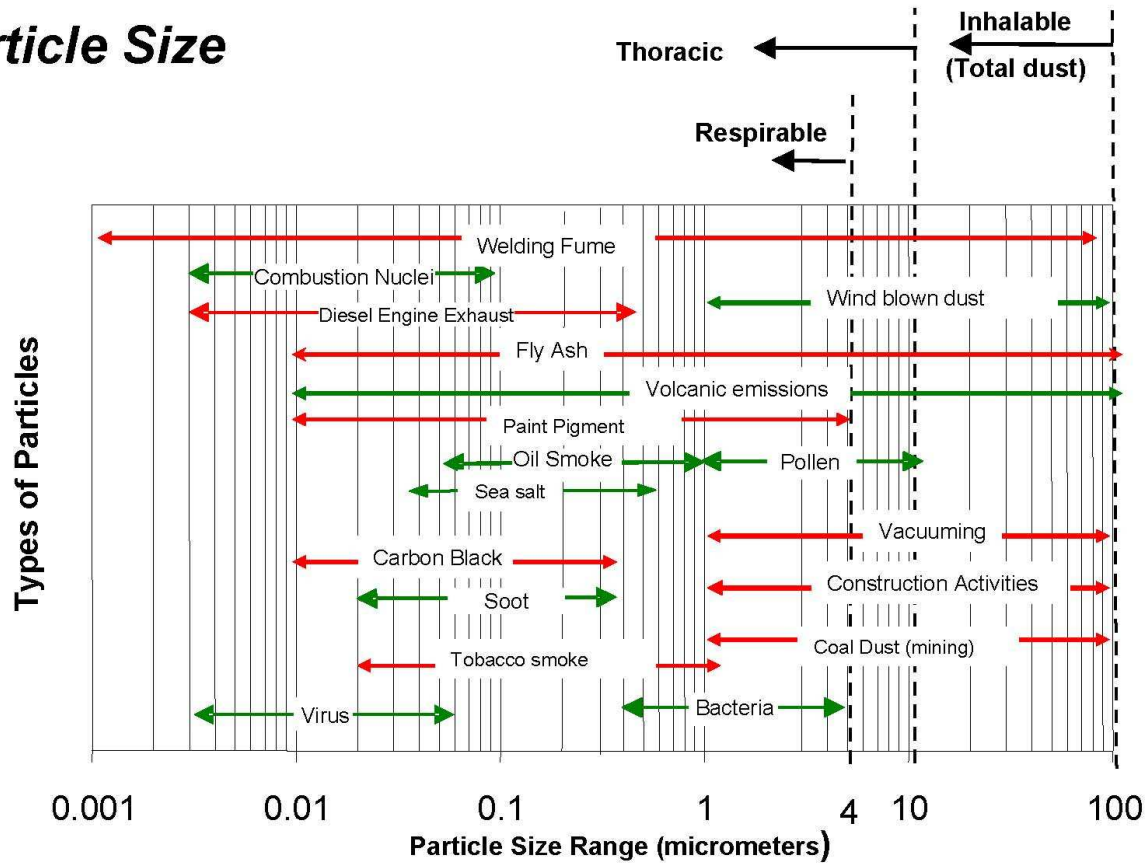
Engineering Controls

HEPA Filtration Efficiency=100% - Penetration



Particle Size

Particle Size



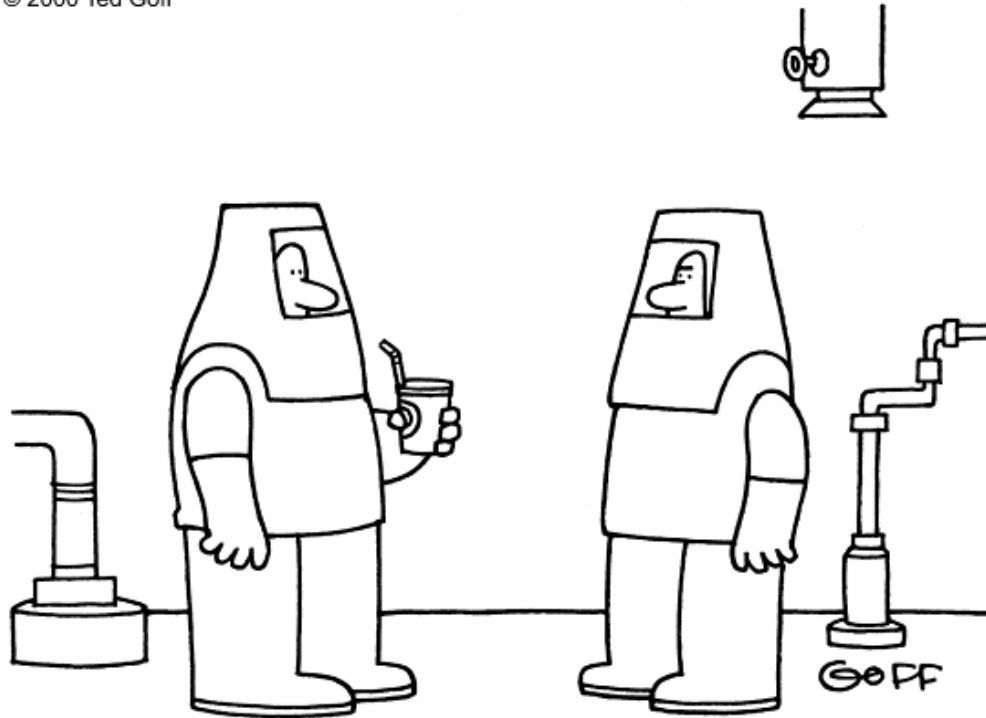
← Environmental / Naturally Occurring Particles →

← Workplace / man-made Particles →



Personal Protective Equipment

© 2000 Ted Goff



"What's wrong? I'm wearing
all my protective equipment."

Personal Protective Equipment

- Appropriate garb
 - Dedicated attire, hair cover, face mask, beard cover as required, gown, sterile gloves and shoe covers



Specific PPE for HDs

- Gloves: *tested with hazardous drugs*, powder-free, latex, nitrile, neoprene
- Gowns: *chemical protective*, disposable, single-use, cuffs, back closure
- Eye protection: when splashing is possible
- Respirator/masks: for aerosols and spill clean-up

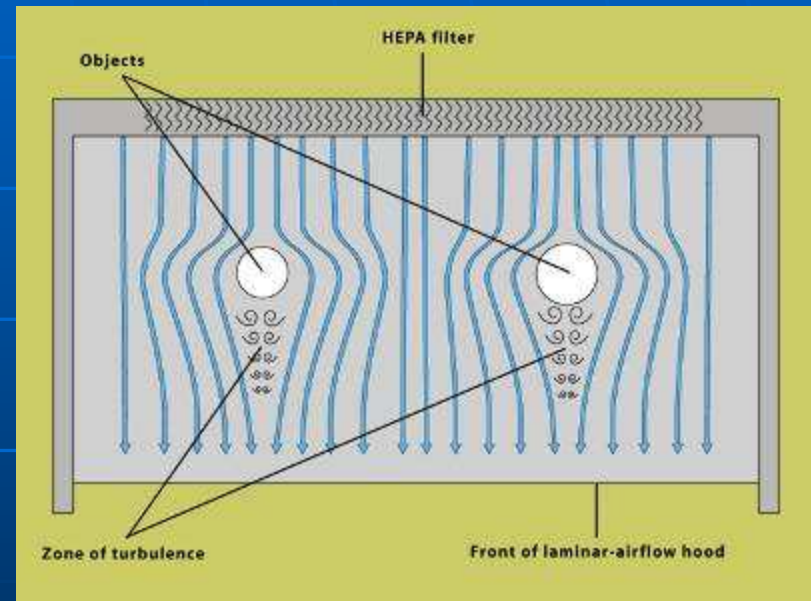
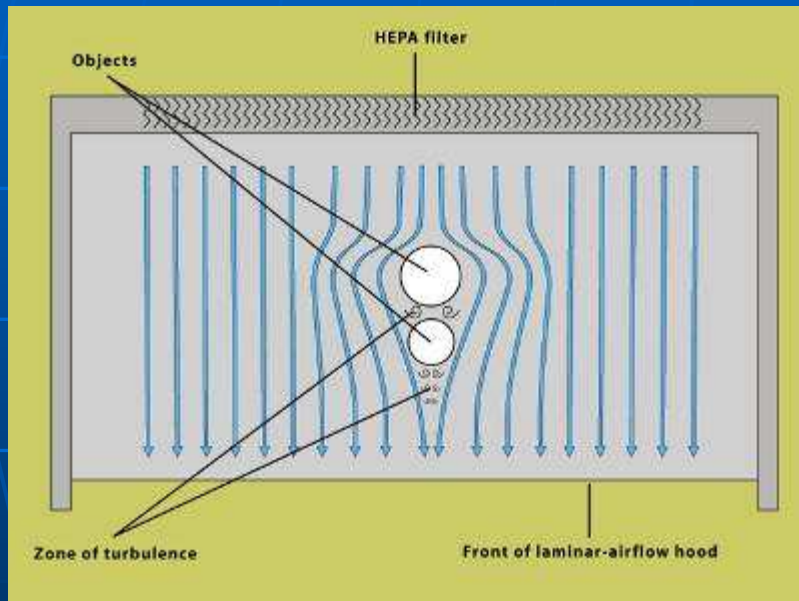
Work Practice Controls

- Minimize contamination
 - Nonviable
 - Viable
- Maximize containment
 - Reduce hazardous drug contamination of environment, on supplies and final CSP

Work Practice Controls

- Maximize “first-air” effect to ensure asepsis of CSP
 - First-air: Air exiting HEPA filter that is virtually free of contamination
 - Proper placement of components and operator aseptic technique critical to maintain sterility of CSP

Work Practice Controls



Courtesy of ASHP, Compounding Sterile Preparations, v2.0

Work Practice Controls

- Routine disinfection and sanitization of components and work areas
- Proper aseptic technique
 - "First-Air"
- Quality Assurance Activities
 - Environmental Monitoring
 - Use of Validated compounding and sterilization methods
 - Use of calibrated and proper maintained equipment

Closing Thoughts

- Patient safety is paramount
- Protecting the worker, patient and environment is critical
- Use evidence-based science first and foremost **HOWEVER** best practices and extrapolated principles may be required
- Documentation is a critical aspect of quality

“It isn't that they can't see the solution. It is that they can't see the problem.”

G. K. Chesterton