Critical Points for Effective Training of Aseptic Technique

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1

Learning and Performance Objectives

At the conclusion of this session, you will be able to:

- Recite basic definitions that apply to sterile compounding.
- List elements of proper conduct in controlled environments, staging of supplies, organization of work area and resanitization of hands.
- Describe proper use of first air in both vertical and horizontal airflow.
- Explain how to access and manipulate syringes, needles, ampules, vials, bags and other compounding supplies.
- Discuss the use and integration of emerging technologies into ISO classified spaces and their impact on first air and aseptic technique work practices.

2

Important Definitions

Aseptic Technique

A set of specific work practices and procedures performed under carefully controlled conditions with the goal of minimizing the introduction of contamination.[1]

Notice the definition says "specific" work practices…make sure the elements of aseptic technique are defined in your SOPs.

[1]Kastango ES. Spread the Word: Aseptic Technique Prevents Infection. Pharmacy Purchasing and Products Magazine. April 2009. Retrieved on 2/20/18 from https://www.pppmag.com/article/522/.

3

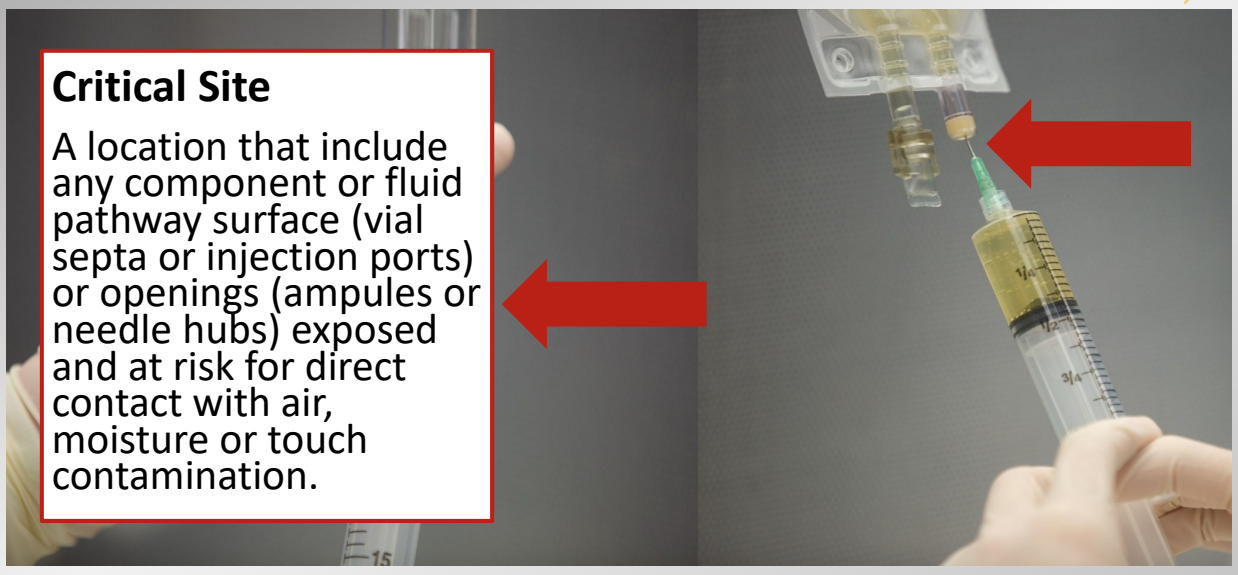
Elements of Aseptic Technique

- Preparation before reporting to work
- General workplace rules
- Hand hygiene and garbing (next lecture)
- Proper supply staging
- General conduct in controlled environments
- Organization of work and work surfaces
- Methods of critical manipulation

Not even sure where to start!

4

Important Definitions (continued)



Critical Site

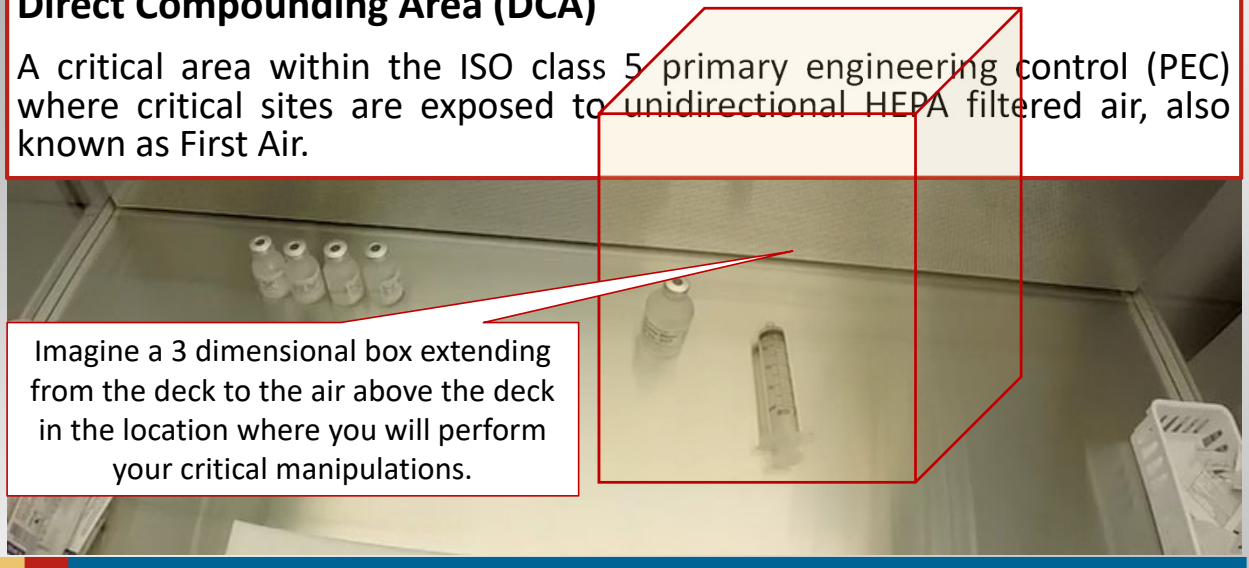
A location that include any component or fluid pathway surface (vial septa or injection ports) or openings (ampules or needle hubs) exposed and at risk for direct contact with air, moisture or touch contamination.

5

Important Definitions (continued)

Direct Compounding Area (DCA)

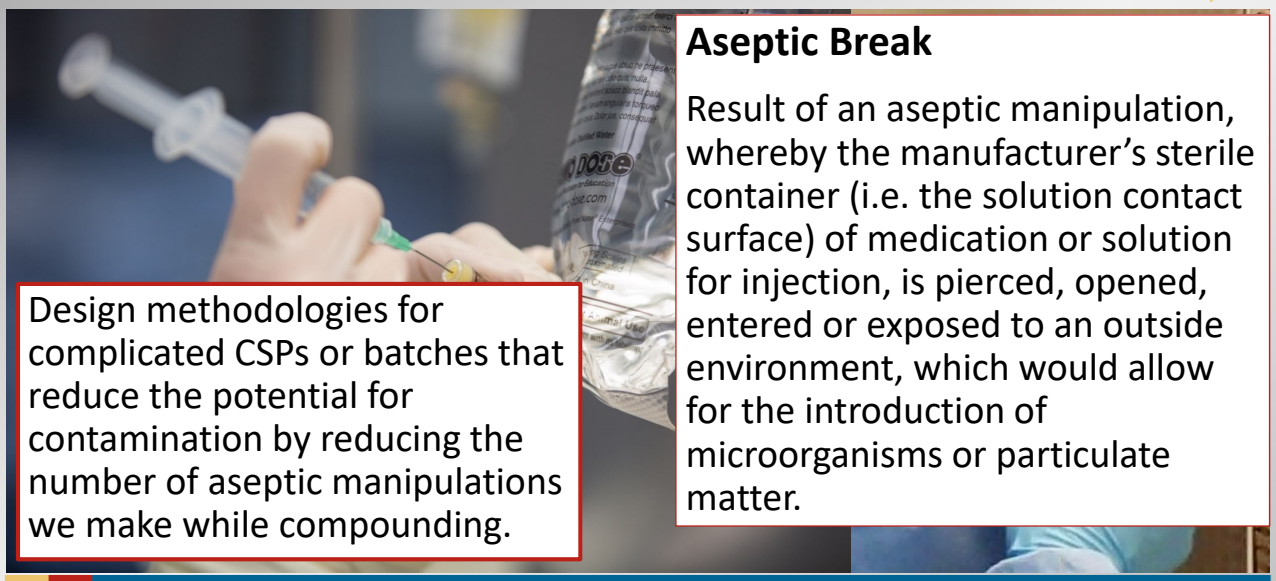
A critical area within the ISO class 5 primary engineering control (PEC) where critical sites are exposed to unidirectional HEPA filtered air, also known as First Air.



Imagine a 3 dimensional box extending from the deck to the air above the deck in the location where you will perform your critical manipulations.

6

Important Definitions (continued)



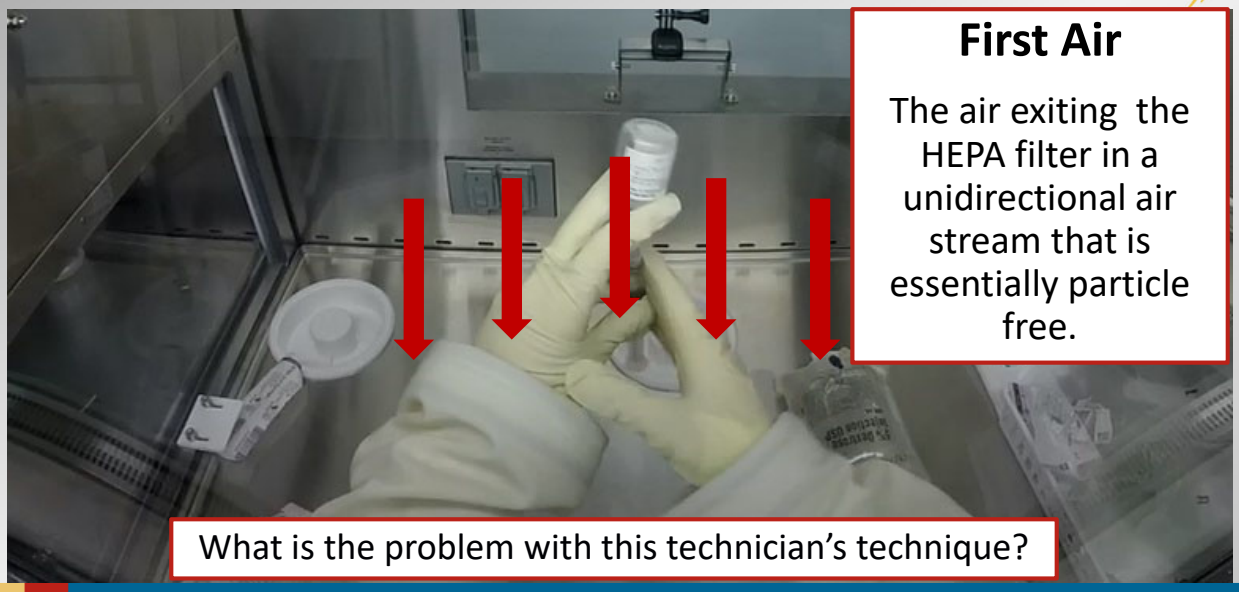
Design methodologies for complicated CSPs or batches that reduce the potential for contamination by reducing the number of aseptic manipulations we make while compounding.

Aseptic Break

Result of an aseptic manipulation, whereby the manufacturer's sterile container (i.e. the solution contact surface) of medication or solution for injection, is pierced, opened, entered or exposed to an outside environment, which would allow for the introduction of microorganisms or particulate matter.

7

Important Definitions (continued)



First Air

The air exiting the HEPA filter in a unidirectional air stream that is essentially particle free.

What is the problem with this technician's technique?

8

Low and Medium versus High Risk

In sterile to sterile compounding, sterility must be ***maintained*** but in nonsterile to sterile compounding, sterility must be **achieved** (which is much harder to do).

The 2018 proposed changes to <797> propose 2 categories based on:

1. conditions under which they are made
2. probability of microbial growth
3. time period within which they must be used

9

General Workplace Rules

- Entry to controlled areas must be limited to authorized, trained and competent employees who need access such as:
  - Technicians and Pharmacists
  - Environmental Services
- Visitors including regulators and consultants
  - Do you have a visitor SOP? If not, write one
  - Keep makeup remover pads in the facility
- Anyone entering controlled areas must follow hand hygiene and garbing

10

General Workplace Rules (continued)

What about smokers?

- A typical smoker generates 10,000 to 20,000 particles (0.03 to 1.0 µM) for up to 10 minutes after smoking[1]
- A non smoker generates less than 1000 particles
- Some suggest gargling with water before entry into ISO classified space
- Others suggest waiting 20 minutes before entering ante-room

[1]Invernizzi G et al. Residual tobacco smoke: measurement of its washout time in the lung and its contribution to environmental tobacco smoke. Tob Control. 2007. 16(1): 29-33. Retrieved 3/8/2019 from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2598442/

11

General Workplace Rules (continued)

- What about breaks?
  - Organize work so that the compounder is not frequently leaving the ISO 7 space
  - Frequent doffing and donning garb:
    - Wastes time, increases fatigue, increases stress
- Optimally, work for 2.5 to 3 hours then take break/lunch
- Maximize uninterrupted time for compounding

12

Hand Hygiene and Garbing

- Very important element that affects contamination control and ultimately aseptic technique
- You will be given the opportunity to practice your skills and then later you will be tested on these skills.
- Must pass these elements as part of the QP503A certification
  - Hand hygiene and garbing competency
  - One instance of Initial Gloved Fingertip sampling
- Will be reviewed in detail after the break

13

14

Proper Supply Staging: Current USP Chapter <797>

#1 Wipe Components in ante-room/prep area

- Current Chapter <797> requires drugs and components must be *wiped or sprayed* with an appropriate disinfectant after they are removed from cardboard packaging and before they are brought into buffer room or beyond the perimeter of the SCA

#2 sIPA immediately before placing in PEC

- With the exception of syringe and needle packages, all items are wiped down with sterile 70% IPA immediately prior to their placement inside the ISO 5 space
- Must use low-linting wipe wetted with sterile IPA or preferably sterile low-linting wipes presaturated with sterile 70% IPA

15

Proper Supply Staging: Proposed USP Chapter <797>

6.4 Cleaning and Disinfecting Compounding Supplies for the Classified Areas and SCAs

No shipping carton(s) or other corrugated or uncoated cardboard are allowed in the classified area or SCA. Before compounding supplies are introduced into a classified area or SCA, they must be wiped with a sporicidal agent or sterile disinfectant (e.g., sterile 70% IPA) using low-lint wipers. After the sporicidal or sterile disinfectant is applied and wiped on the surface, the agent must be allowed to dwell for the minimum contact time specified by the manufacturer, during which time the item cannot be disturbed. The agent used for wiping the packaging must not alter the product label.

Any item to be transferred into the PEC must be wiped with a sporicidal agent or sterile disinfectant (e.g., sterile 70% IPA) using low-lint wipers. The agent must be allowed to dwell for the minimum contact time specified by the manufacturer, during which time the item cannot be disturbed. The agent used for wiping the packaging must not alter the product label.

6.5 Disinfecting Critical Sites within the PEC

Critical sites (e.g., vial stoppers, ampule necks, and intravenous bag septums) must be disinfected by wiping them with sterile 70% IPA in the PEC. The critical site must be wiped in one direction ensuring that both chemical and mechanical actions are used to remove contaminants. The sterile 70% IPA must be allowed to dry before entering or puncturing stoppers/septums with sterile needles or breaking the necks of ampules.

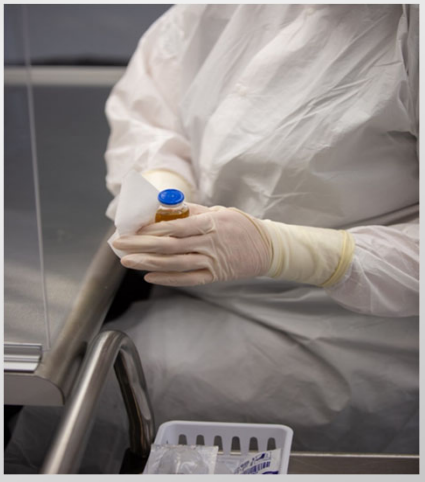
16

Proper Supply Staging: CriticalPoint Best Practice

#1 Wipe components in ante-room/prep area

#2 sIPA immediately before placing in PEC

- Wipe with EPA registered one-step sporicidal disinfectant cleaner



17

General Conduct in Controlled Environments

- Move slowly, it really does make a difference!

Activity[1]	Particles Generated
Sitting quietly	100,000/minute
Walking slowly (1.9 miles/hour)	5,000,000/minute
Walking medium (3 miles/hour)	7,500,000/minute
Walking fast (5 miles/hour)	10,000,000/minute

[1]Particle Measuring Systems. Basic Guide to Particle Counters and Counting. 2011. Accessed on 3/6/19 from Pharmaceutical Online.

18

General Conduct: Talking

- Keep conversations to a minimum in ISO Classified environments
- If your mask gets wet (from speaking, sneezing, etc.), change it immediately
- Do not speak directly in ISO class 5 environments (PECs)!
- Just because we work together, doesn't mean we need to chat!

19

General Conduct: No PEDs!

- Under NO CIRCUMSTANCES can compounding staff carry any personal electronic devices (PEDs) into the controlled environments!
  - 100% of phones contaminated with either single or mixed bacterial agents[1]
  - Most prevalent methicillin-resistant *S. aureus* and coag negative staphylococci[1]
  - Mean organisms per phone between 1720 to 2192[1]

[1]Selim HD, Abaza AF. Microbial contamination of mobile phones in a health care setting in Alexandria, Egypt. GMS Hyg Infect Control 2015. Retrieved on 3/8/2019 from http://www.egms.de/static/en/journals/dgkh/2015-10/dgkh000246.shtml.

20

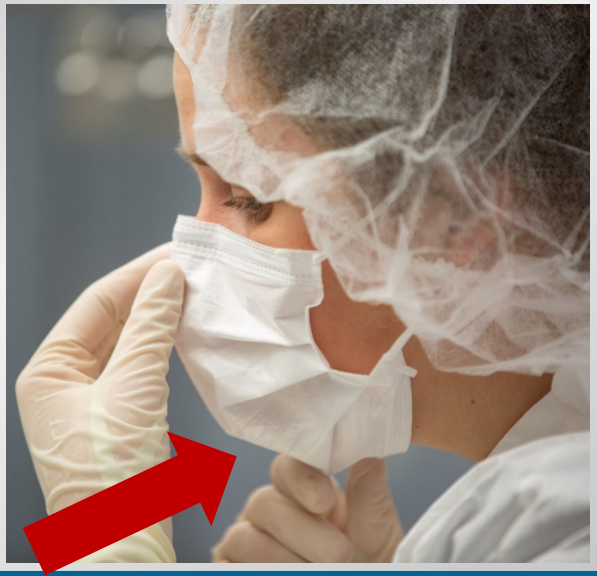
General Conduct: Do not touch your face!

- Remember the movie, Contagion? A line from it said "the average person touches their face 2000 to 3000 times per day." That's an average of 3 to 5 times per waking minute!
- Students studied touched their face 16 times per hour[1]
- Another study of medical students identified 23 times per hour[2]

[1]Nicas M, Best D. A study quantifying the hand-to-face contact rate and its potential application to predicting respiratory infection. J Occup Environ Hyg. 2008. 5(6): 347-52. Available for purchase at PubMed.gov
[2]Kwok YL, Gralton J. McLaws ML. Face touching: a frequent habit that has implications for hand hygiene. Am J Infect Control. 2015. 43(2):112-114

21

Do not touch your face!



22

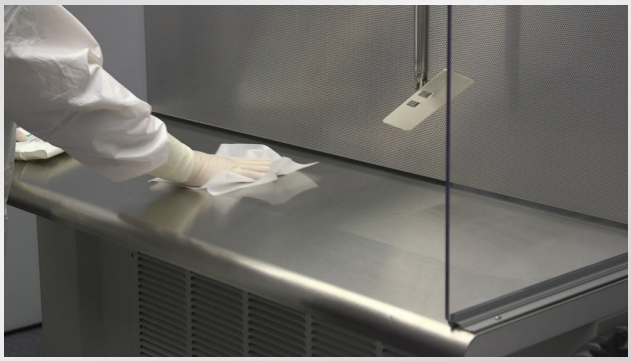
PEC: Clean, Disinfect and Sanitize

- Cleaning and Disinfection
  - Using a EPA registered one-step disinfectant cleaner
    - Bactericidal
    - Sporicidal
  - Once a day preferably at the end of the compounding day
  - All surfaces of the PEC must be wiped down including irregular surfaces
- Sanitizing
  - After using EPA registered one-step disinfectant cleaner wipe all surfaces with sterile IPA (sIPA)
  - Wipe with sIPA between batches, between preps, when it is visibly soiled, at least every 30 minutes
  - Which surface in what order?
  - Let's watch a video!

23

Conduct in ISO 5: SANITIZE the Deck

- Sanitize the deck frequently during the compounding day
- Before beginning compounding
- At least every 30 minutes
- Between batches or patient-specific
- **Sanitize the deck in the DCA much more frequently**
- Wet sufficiently with sIPA and allow to dry



24

Introducing Equipment to ISO Class 5

- Proposed changes to <797> state
  - Placement of equipment (like automated compounders) must be verified by smoke under dynamic conditions to verify that there is minimal disruption in airflow.
    - EM2400
    - Repeater Pumps
    - IV Compounding Workflow Management Equipment
  - Recommend documenting smoke testing with a video and identifying placement of equipment in written SOPs

25

Process Validation

- Example: EM2400 Process validation
  - Using media (vials, syringes, bags)
  - 2L H2O bag for calibration purposes only, never add water to media
  - Use media 1 liter bag as universal ingredient
  - Mimic most complex set up (pediatric) with manual adds
  - In this case it's a 4 hour media fill!!!

26

Ergonomics in the Controlled Environments

- Chairs vs. Stools?
  - Chairs are difficult to clean and take about 20 minutes to clean properly
  - Stools made of stainless steel and with a pedestal instead of wheels are easier to clean
  - Need to be height adjustable and have a foot rest to relieve low back pressure
  - Some compounders prefer standing which is perfectly acceptable
- Anti-fatigue mats:
  - No matter what brand, they are difficult to clean properly

27

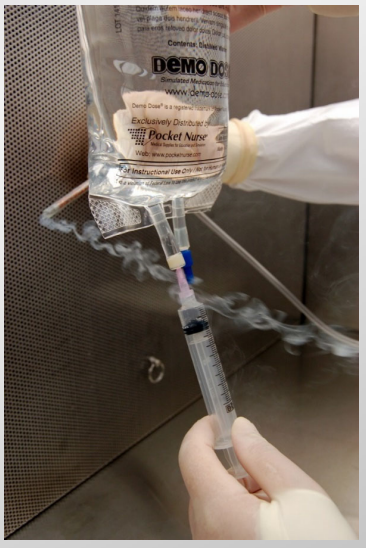
Aseptic Related Behavior in ISO 5

- Always remember:
  - DO NOT lean your forearms against the PEC work surface
  - DO NOT support your elbows inside the PEC work surface
  - Use a technique for holding/manipulating your supplies and ingredients that DOES NOT BLOCK first air
  - Avoid grabbing the syringe plunger, use the wings
  - Work in the DCA (smoke test to identify good first air and proper finger and hand placement)

28

Organization of Work Space

- Observe “area clearance” which means that you do not begin work unless the work space is first cleared of any contents from the previous batch or patient
  - Work on only 1 batch or patient CSP at a time
  - Area clearance applies to labeling patient or batch as well
- Remembering unidirectional HEPA filtered air (First Air)
- Visualize first air in your mind and remember not to block first air from bathing the critical site

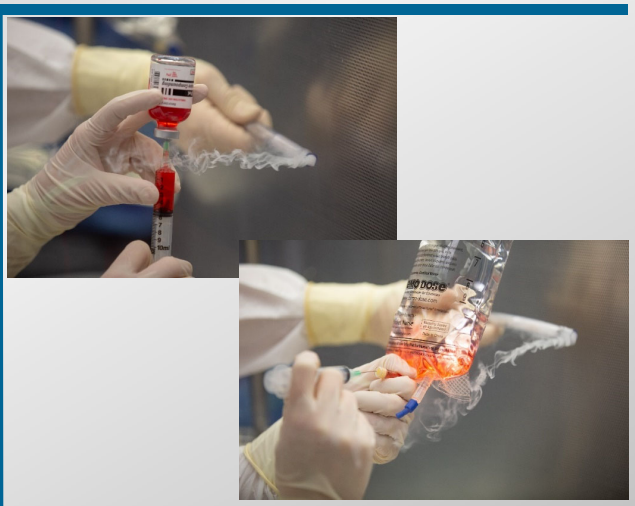


29

Conduct in ISO Class 5: Smoke Pattern Testing

Vertical Airflow

Horizontal Airflow



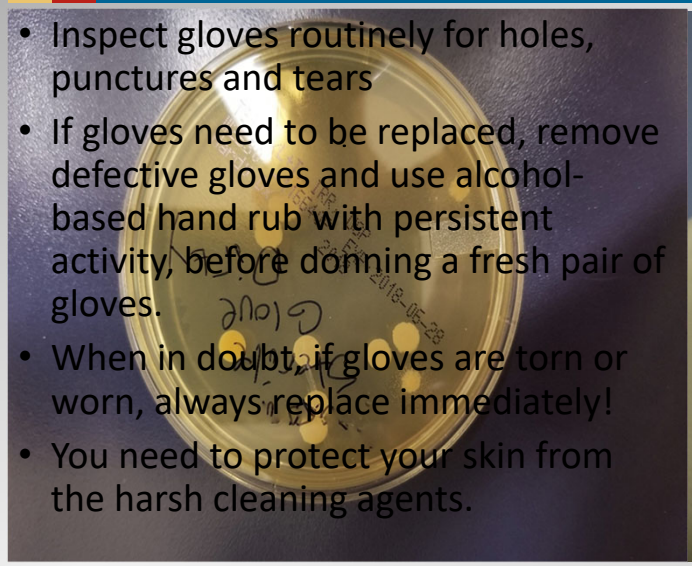
30

Conduct in ISO 5: Resanitize gloves

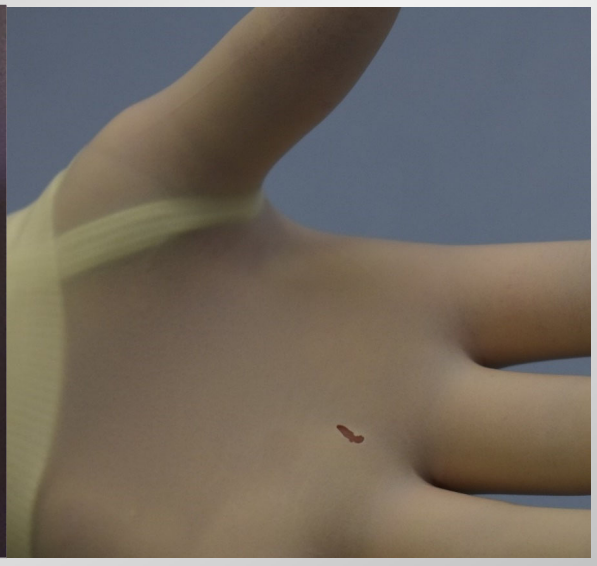
- Gloves should be sanitized routinely throughout the compounding day
- Spray gloved hands with sIPA and rub together, including in between fingers and wrists to ensure that the sIPA comes into contact with all surfaces of the gloves
- Allow gloves to thoroughly dry prior to beginning or continuing the preparation of CSPs
- Gloves become contaminated when they come into contact with non-sterile surfaces (e.g. phones, keyboards, vial shields) therefore, they need to be sanitized regularly
- Sanitize gloves anytime hands leave ISO 5 area
- Always sanitize gloves just prior to performing any aseptic procedures

31

Conduct in ISO 5: When to replace gloves



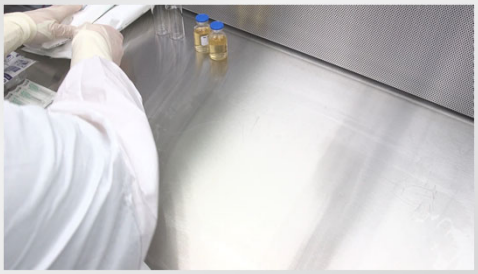
- Inspect gloves routinely for holes, punctures and tears
- If gloves need to be replaced, remove defective gloves and use alcohol-based hand rub with persistent activity, before donning a fresh pair of gloves.
- When in doubt, if gloves are torn or worn, always replace immediately!
- You need to protect your skin from the harsh cleaning agents.



32

Critical Manipulations: Sanitizing Critical Sites

- How to use them?
  - Use once and discard? Use other side? Use until no longer wet?
  - Reality is there's no data but TJC will cite infection control failure if use more than once
  - Wipe in a single direction 3 times and allow to dry
  - Must be used on all CRITICAL SITES (vial septa, ampules neck, minibag port)



33

How many times can a needle be used?

- Everyone reuses needles in compounding, but should we being doing so?
- A needle shows changes after 1st use but is significantly disfigured after 6.
- Most data comes from studies discouraging reuse of diabetic needles.

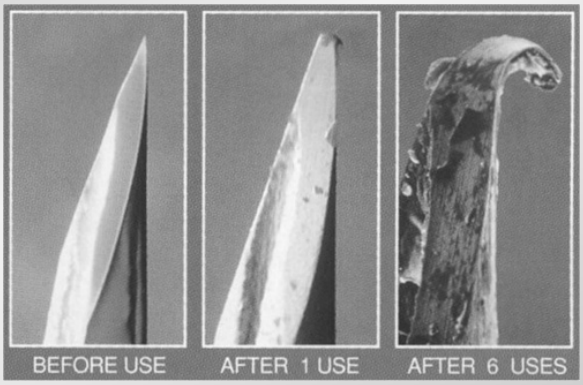


Image from Diabetes Daily retrieved on 3/6/19

34

What is a Contamination?

- Torn glove
- Particulate matter floating in a CSP
- Needle stick injury
- Spill of medication
- Touching (operator touching their faces or adjusting their clothing while wearing sterile gloves, adjusting eye glasses)

26 medical students were observed to touch their face 23 times per hour.

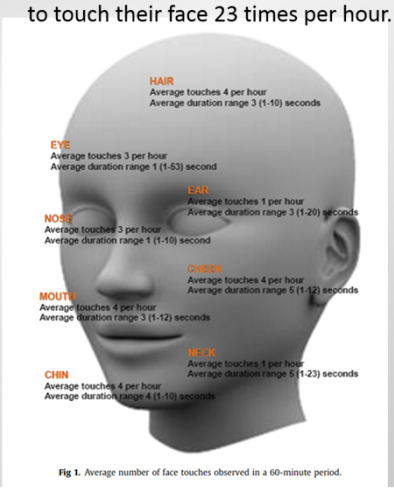


Fig 1. Average number of face touches observed in a 60-minute period.

Y.L.A. Kwok et al. / American Journal of Infection Control 43 (2015) 112-4

35

What to do?

- Assess the severity
- Does CSP need to be discarded and restarted?
- Does PEC need to cleaned?
- Resanitize gloves?
- Reglove?
- Re-do hand hygiene?

36

Limit Aseptic Breaks by Vigilance

- Each compounding staff member must be vigilant at all times!
- Vigilance is:
  - Difficult
  - Takes focus
  - Constant awareness
- Suggest you perform smoke testing with all new staff as well as tenured staff to sharpen their skills
- Understanding critical sites and DCA will allow them to perform at a higher standard
- Best to perform Aseptic Technique Competency when staff does NOT know they are being observed then give immediate feedback

37

Limit Aseptic Breaks by Design

- Strongly encourage the use of a Master Formulation Records for all common CSP types made at your pharmacy:
  - Standardize methodology so that batch can be made with the least amount of aseptic breaks
  - e.g., rather than using 10 one gram vials use 10 gram pharmacy bulk package
- Another recommendation:
  - If the number of aseptic breaks is greater than 10 per final CSP, even if they are made from all FDA manufactured sterile products, filter with a 0.22 micron filter downstream of the breaks

38

Objective Competency Verification

- These steps are a VERY important part of maintaining high quality standards in your cleanroom.
- They promote good aseptic technique
- It is recommended to label your plates after sampling with a designated cleanroom sharpie

<797> requires GFS during media-fill, but CriticalPoint strongly recommends surface sampling be performed during the media-fill as well

39

Summary

- Good Aseptic technique can be achieved by remembering a few basic rules
  - Limit aseptic breaks
  - Visualize first air
  - QA (MFU, GFS, and SS)
  - Respect all SOPs
  - Be a leader by always promoting good practices in your cleanrooms!
  - Encourage feedback from peers and managers
  - ALWAYS be vigilant about your own behaviors!

40

"I had a miraculous dream in which our list of questions all had answers."

41