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Navigating USP and Other Important Compounding Updates

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Disclosure Statement

Matt Lester has a financial interest with PCCA, and the relationship has been mitigated through peer review of this presentation. There are no relevant financial relationships with ACPE defined commercial interests for anyone else in control of the content of the activity.

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Pharmacist and Technician Learning Objectives

1. Review changes in state and federal oversight of compounding pharmacies, including USP 795, 797, and 800.
2. Summarize FDA guidance documents about insanitary conditions at compounding facilities.
3. Outline safety and quality considerations and strategies for reducing common compounding errors.

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Elements

- USP Chapters
- FDA Guidance
- Other Bodies

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What is Quality?

*Note – All gluten has been removed from this slide for safety purposes.

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1 STOP PATTY SHOP	1708 AMSTERDAM AVENUE Manhattan 10031	Bakery Products/Desserts	41430594	A
5 ESTRELLA BAKERY	3861 BROADWAY Manhattan 10032	Bakery Products/Desserts	41166881	A
ALOAF CAFE	170 EAST 110 STREET Manhattan 10029	Bakery Products/Desserts	50058240	B
AMY'S BREAD	75 NINTH AVENUE Manhattan 10011	Bakery Products/Desserts	40526104	A
AMY'S BREAD	672 9 AVENUE Manhattan 10036	Bakery Products/Desserts	40424894	A
AMY'S BREAD	445 5TH AVE Manhattan 10016	Bakery Products/Desserts	50111561	A
AMY'S BREAD	1220 5 AVENUE Manhattan 10029	Bakery Products/Desserts	50070991	A
AMY'S BREAD @ CAFE AT 200 LEX	200 LEXINGTON AVENUE Manhattan 10016	Bakery Products/Desserts	50118612	C
ANDRES HUNGARIAN STRUDELS	1049 1 AVENUE Manhattan 10022	Bakery Products/Desserts	50108412	A
ANGELA'S CAKE	2220-2222 AMSTERDAM AVE Manhattan 10032	Bakery Products/Desserts	50074297	A

Reference - Quick search of NY restaurant inspections for bakeries in Manhattan.

SAN ANTONIO – A southside bakery cited for multiple violations by health inspectors decided it was better to close the business than make all the necessary corrections.

www.ksat.com/news

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⟨795⟩ Major Points

- Quality of environment
  - People
  - Cleaning
- Training and documentation
- Designated Person (DP)
- Water activity
- Beyond-use dates

⟨795⟩ Introduction and Scope

Minimum standards to be followed for the preparation of compounded nonsterile preparations (CNSPs) for humans and animals.

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⟨795⟩ Introduction and Scope

Nonsterile compounding is defined as combining, admixing, diluting, pooling, reconstituting other than as provided in the manufacturer's labeling, or otherwise altering a drug product or bulk drug substance to create a nonsterile preparation.

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⟨795⟩ Introduction and Scope

Requirements in this chapter must be followed to minimize harm, including death, to human and animal patients that could result from:

- Excessive microbial contamination,
- Variability from the intended strength of correct ingredients (e.g., ±10% of the labeled strength),
- Physical and chemical incompatibilities,
- Chemical and physical contaminants,
- Use of ingredients of inappropriate quality

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Now You Matter

Handling of nonsterile hazardous drugs (HDs) must additionally comply with Hazardous Drugs—Handling in Healthcare Settings ⟨800⟩

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CNSPs that must comply with this chapter include, but are not limited to, the following dosage forms:

- Solid oral preparations
- Liquid oral preparations
- Rectal preparations
- Vaginal preparations
- Topical preparations (i.e., creams, gels and ointments)
- Nasal and sinus preparations intended for local application (i.e., nasal sprays and nasal irrigations)
- Otic preparations (excluding use in perforated eardrums)

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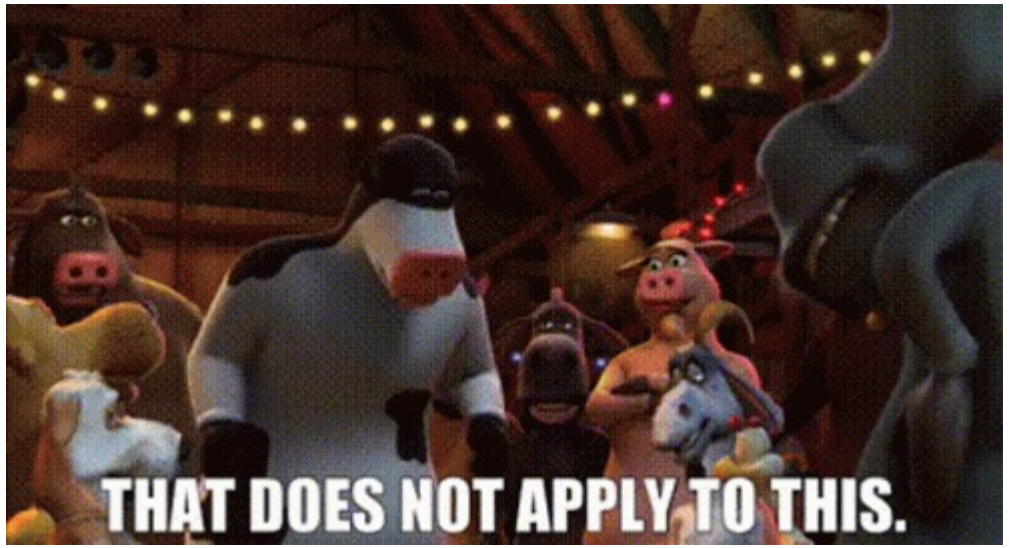
⟨795⟩ What Does Not Apply?

- Nonsterile radiopharmaceuticals ⟨825⟩
- Reconstitution
- Repackaging (of manufactured products)
- Splitting tablets
- Administration (within 4 hours, single dose)



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See Something, Say Something

The compounding facility's leadership and all personnel involved in preparing, storing, packaging, dispensing and transporting CNSPs are responsible for:

- Ensuring that the applicable practices and quality standards in this chapter are continually and consistently applied to their operations
- Proactively identifying and remedying potential problems within their operations.

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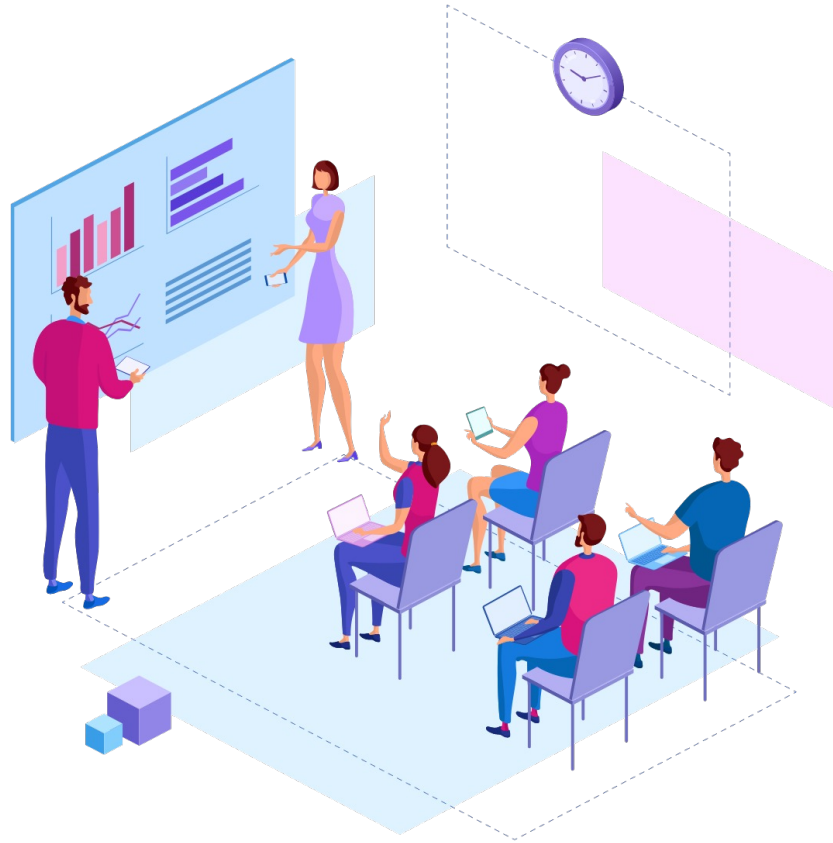
Designated Person(s)

Designated person(s): One or more individuals assigned to be responsible and accountable for the performance and operation of the facility and personnel for the preparation of CNSPs

Personnel Training and Evaluation

- Personnel who compound or have direct oversight of compounding personnel must complete training **initially** and **at least every 12 months** in appropriate compounding principles & practices
- This program must equip personnel with knowledge and training in the required skills necessary to perform their assigned tasks



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Training and Documentation

- Hand hygiene
- Garbing
- Cleaning and sanitizing
- Handling and transporting components and CNSPs
- Measuring and mixing
- Proper use of equipment & devices selected to compound CNSPs
- Documentation of the compounding process
- Understand the requirements of ⟨795⟩
- Understand and interpret SDS, and if applicable COA
- Read & understand procedures related to their compounding duties

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Environmental Quality – Personnel

- Requirements closer to sterile compounding regarding details
- No “adornments” that can interfere with compounding activity
- **No earbuds or headphones**
- Accommodations can be made by DP

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Give Me a Hand

Minions: Rise of Gru - 2022

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Garb and Glove Requirements

- Gloves are a **must**
- Other garb **must** be appropriate to activity
- Defined in SOPs (including hand washing)
- Changing when and where
- Re-use or not **must** be in SOPs
- For HDs, proper PPE **MUST** be worn (& disposed) in accordance to ⟨800⟩

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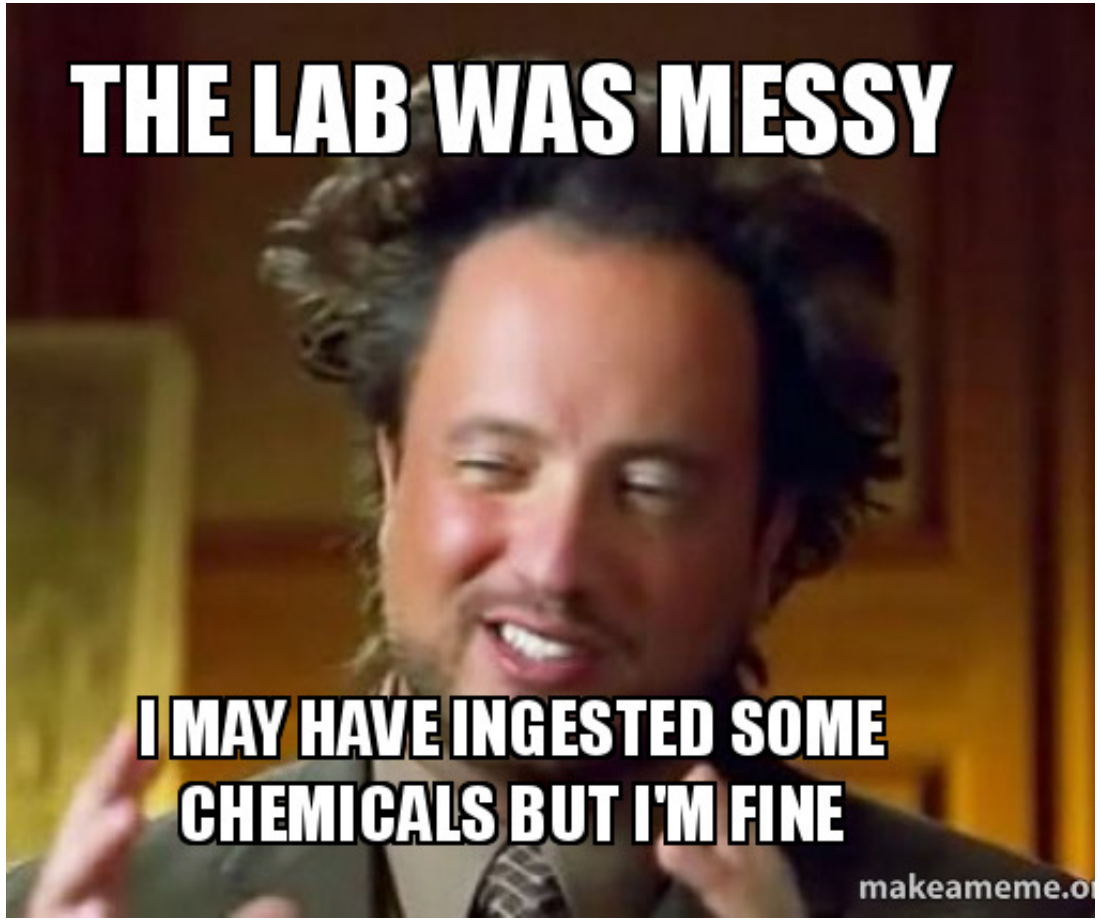
Compounding Area

- Area must be designated in SOPs
- Well lit and sanitary
- Neat and orderly
- Prevent cross-contamination



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Storage Area

- **Must** monitor/document temperature
- **Must** have SOPs to detect and reduce risk of excursions
- All CNSPs, components, equipment and containers **MUST** be off the floor

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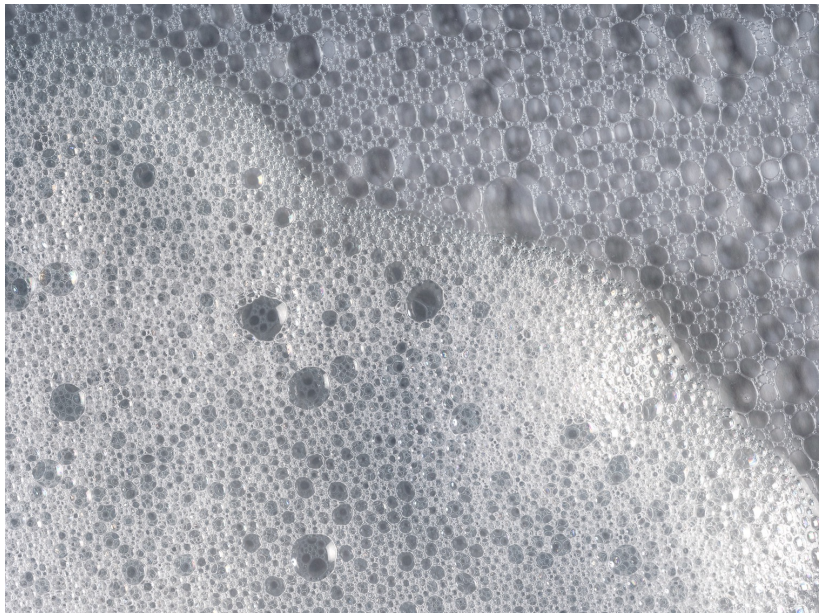
Cleaning, Sanitizing or Both

- Cleaning: The process of removing substances (e.g., organic and inorganic material) from objects and surfaces, normally accomplished by manually or mechanically using water with detergents or enzymatic products.
- Sanitizing agent: An agent for reducing, on inanimate surfaces, the number of microorganisms (e.g., 70% isopropyl alcohol).
- EPA registered agents? Combination products?



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Minimum Frequency for Cleaning and Sanitizing in Nonsterile Compounding Area

Site	Minimum Frequency
Work Surfaces	• At the beginning and end of each shift on days when compounding occurs, after spills, and when surface contamination (e.g., from splashes) is known or suspected • Between compounding CNSPs with different components
Floors	• Daily on days when compounding occurs, after spills, and when surface contamination (e.g., from splashes) is known or suspected
Walls	• When visibly soiled, after spills, and when surface contamination (e.g., from splashes) is known or suspected
Ceilings	• When visibly soiled and when surface contamination (e.g., from splashes) is known or suspected
Storage Shelving	• Every 3 months, after spills, and when surface contamination (e.g., from splashes) is known or suspected

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Cleaning and Sanitizing of Equipment

Table 2. Minimum Frequency for Cleaning and Sanitizing in Nonsterile Compounding Area(s)—Equipment

Site	Minimum Frequency
CVE	• At the beginning and end of each shift on days when compounding occurs, after spills, and when surface contamination (e.g., from splashes) is known or suspected • Clean and sanitize the horizontal work surface of the CVE between compounding CNSPs with different components
BSC	• At the beginning and end of each shift on days when compounding occurs, after spills, and when surface contamination (e.g., from splashes) is known or suspected • Clean and sanitize the horizontal work surface of the BSC between compounding CNSPs with different components • Clean and sanitize under the work surface at least monthly
Other devices and equipment used in compounding operations	• Before first use and thereafter in accordance with the manufacturer's recommendations • If no recommendation is available, between compounding CNSPs with different components

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Component Selection (APIs)

- Must comply with the criteria in the USP–NF monograph, if one exists
- Must have a COA that includes specifications (e.g., compendial requirements for quality) & test results for the component that show the API meets expected quality
- In the United States, must be manufactured by an FDA-registered facility

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Component Selection (Non-API)

- Water: Purified Water USP or better quality
  - e.g., Sterile Water for Irrigation USP can be used for compounding nonsterile drug preparations when formulations indicate the inclusion of water

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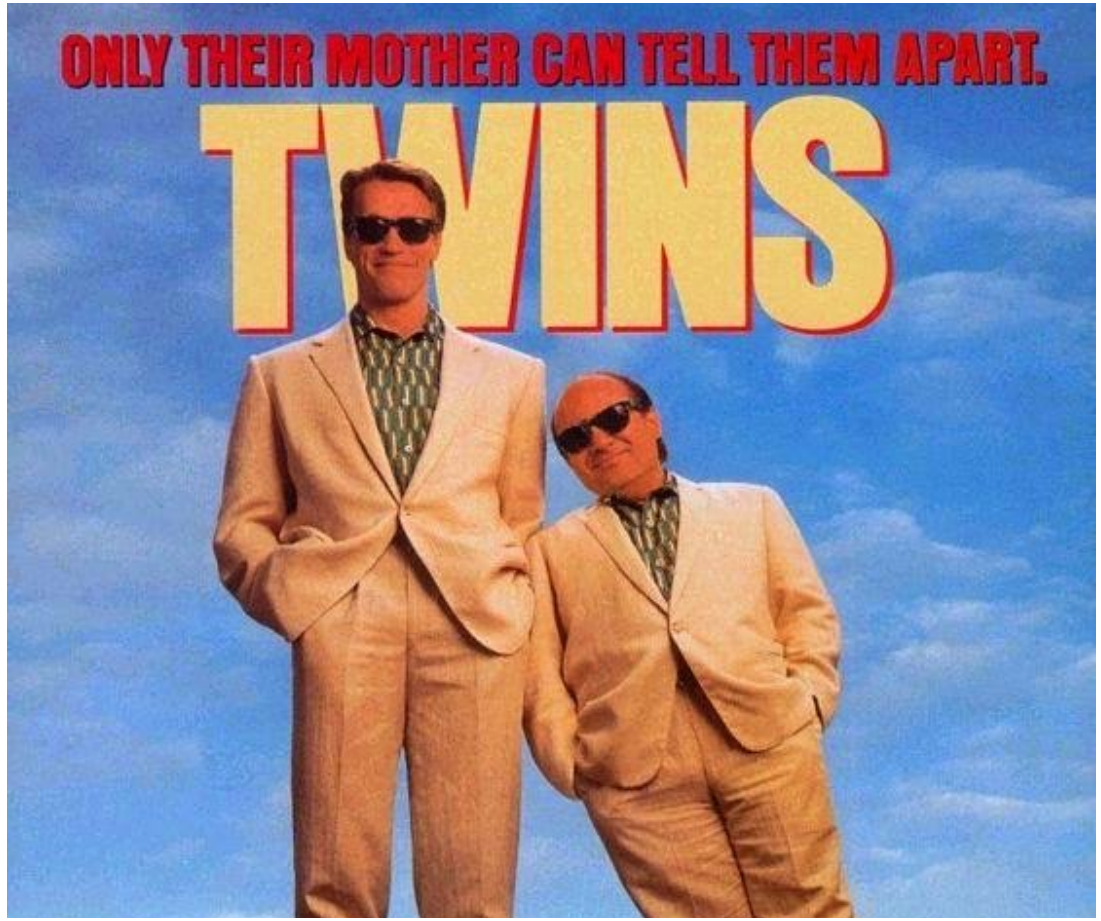
Must Be the Same Thing, Right?

USP General Notices 4.1

- Because monographs may not provide standards for all relevant characteristics, some official substances may conform to the USP or NF standard but differ with regard to nonstandardized properties that are relevant to their use in specific preparations. To assure substitutability in such instances, users may wish to ascertain functional equivalence or determine such characteristics before use.



Compounding Components

- COA review on receipt
- Component evaluation
  - At receipt
  - Prior to use
  - Documentation

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BUD Considerations

- Establish conservatively
- Parameters
  - Everyone getting along
  - Stability within final container
  - Potential for microbial growth
  - Changes in compounding procedure

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USP ⟨795⟩ Beyond-Use Date (BUD) Changes

Section 10. Establishing Beyond-Use Dates

- *Table 4. BUD Limit by Type of Preparation in the Absence of a USP–NF Compounded Preparation Monograph or CNSP-Specific Stability Information*

Type of Preparation	BUDs (days)	Storage Temperature [a]
Aqueous Dosage Forms ($a_w \geq 0.60$)		
Non-preserved aqueous dosage forms [b]	14	Refrigerator
Preserved aqueous dosage forms [b]	35	Controlled room temperature or refrigerator
Nonaqueous Dosage Forms ($a_w < 0.60$)		
Oral liquids (nonaqueous) [c]	90	Controlled room temperature or refrigerator
Other nonaqueous dosage forms [d]	180	Controlled room temperature or refrigerator

a See *Packaging and Storage Requirements* ⟨659⟩.
b An aqueous preparation is one that has an a_w of ≥ 0.6 (e.g., emulsions, gels, creams, solutions, sprays, or suspensions).
c A nonaqueous liquid is one that has an a_w of < 0.6 .
d Capsules, tablets, granules, powders, nonaqueous topicals, suppositories, troches.

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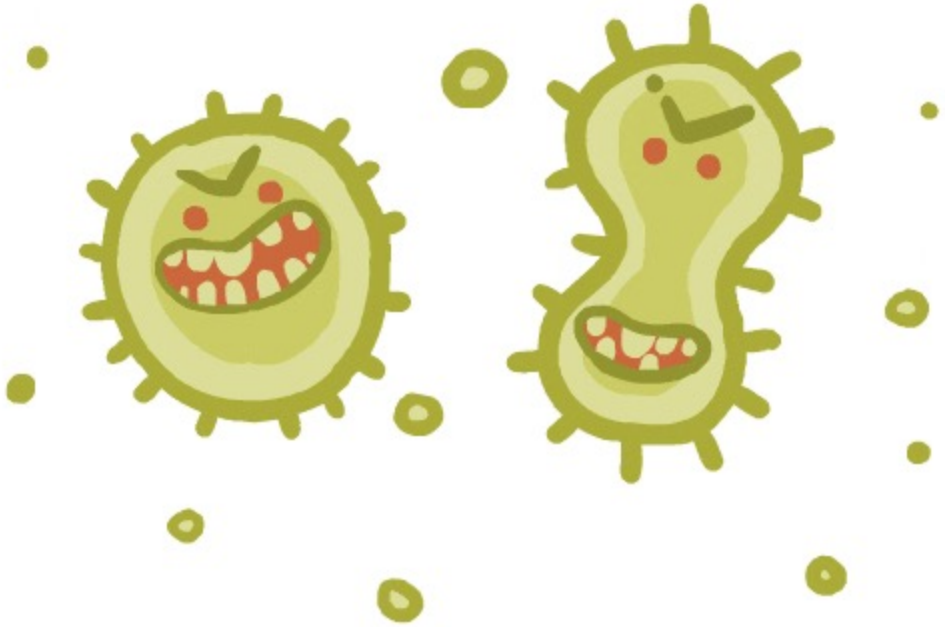
BUD Factors

- Microbial growth
- Aqueous vs non-aqueous
- Hydrolysis
- Raw materials & equipment can contribute to bioburden of CNSP
- Careful consideration of preservatives

USP ⟨51⟩ Antimicrobial Effectiveness Testing

- Antimicrobials added to inhibit the growth of microorganisms inadvertently introduced during the manufacturing or compounding process
- Preservatives cannot be a substitute for good processes
- All useful antimicrobial agents are toxic substances, therefore keep to minimum
- Antimicrobial effectiveness must be demonstrated



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USP ⟨1112⟩ Application Of Water Activity Determination to Nonsterile Pharmaceutical Products

- Water content is not water activity
- Water activity (a_w): A measure of the fraction of total water that is unbound and freely available to participate in chemical, biochemical, or physicochemical reactions or provide an environment that can support microbial growth. Note that a_w is not water content.
- Water activity, (a_w), is a measure of how much of that water is free, i.e., unbound, and thus available to microorganisms to use for growth. Microorganisms will not grow below a certain water activity level—(a_w) 0.90 for most pathogenic bacteria, 0.70 for spoilage molds, and 0.60 for all microorganisms. Food Technology Magazine 11/1/2009

Copyright: Me fishing 2022

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The Long and the Short of It

- USP is not the end-all be-all of BUD
- Due diligence for existing stability data
- Shortest BUD within CNSP
- Cannot exceed BUD of any monographed (USP-NF) component
- CNSPs with stability indicating information **and** antimicrobial effectiveness testing USP <51>, may be increased to a maximum of 180 days when meeting all compliance factors

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Other Tidbits

- Flavoring **is** compounding
- Clarified nasal and sinus preps as nonsterile
- Clarified otic preparations as nonsterile (excluding perforated ear drums)
- pH solutions do not change BUD status

USP ⟨797⟩ Glaring Changes

- Low, med, high to category 1, category 2, category 3
- Includes sterilization method
  - Filtration
  - Terminal sterilization
- Based on the state of environmental control under which they are compounded
- Probability for microbial growth during the time they will be stored
- The time period within which they must be used (BUD)
- Can be compounded by using only sterile starting ingredients, or by using some or all nonsterile starting ingredients

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USP ⟨797⟩ Products Affected

- Injections, including infusions
- Irrigations for internal body cavities (i.e., any space that does not normally communicate with the environment, such as bladder or peritoneal cavity)
- Ophthalmics
- Pulmonary **Inhalations**
- Baths and soaks for live organs and tissues
- Implants

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⟨797⟩ Revisions

Categories of CSPs

- High-Risk
- Medium-Risk
- Low-Risk
- Low-Risk with 12 Hour BUD

Category 1 CSPs	Category 2 CSPs	Category 3 CSPs
• Must be prepared in a PEC that may be located in an unclassified segregated compounding area • Assigned a BUD of ≤ 12 hours at controlled room temperature or ≤ 24 hours when refrigerated	• Must be prepared in a cleanroom suite • May be assigned a BUD of > 12 hours at controlled room temperature or > 24 hours if refrigerated	• Have additional requirements that must be met at all times • May be assigned a BUD longer than established for Category 2 CSPs, up to 180 days

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⟨797⟩ Revisions

Personnel Qualifications

	2008 Last Official Chapter	2015 Revision Proposal	2018 Revision Proposal	2019 Remanded Chapter	Revised Chapter
Visual observation of hand hygiene and garbing	Annually	Every 3 months	Every 6 months	Every 6 months	**Category 1 & 2:** Every 6 months **Category 3:** Every 3 months for personnel who compound Category 3 CSPs
Gloved fingertip and thumb sampling	**Low/Medium-Risk CSPs:** Annually **High-Risk CSPs:** Semi-annually	Every 3 months	Every 6 months	Every 6 months	**Category 1 & 2:** Every 6 months **Category 3:** Every 3 months for personnel who compound Category 3 CSPs as part of garbing competency and aseptic competency
Media-fill testing	**Low/Medium-Risk CSPs:** Annually **High-Risk CSPs:** Semi-annually	Every 3 months	Every 6 months	Every 6 months	**Category 1 & 2:** Every 6 months **Category 3:** Every 3 months for personnel who compound Category 3 CSPs

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⟨797⟩ Revisions

Minimum Garbing Requirements

2008 Last Official Chapter	2015 Revision Proposal	2018 Revision Proposal	2019 Remanded Chapter	Revised Chapter
• Gown • Dedicated shoes or shoe covers • Head and facial hair covers • Face masks • Sterile gloves	Determined based on: • Category • Type of PEC Included: • Gown or coveralls • Disposable covers for shoes • Disposable covers for head and facial hair • Sterile gowns or sleeves • Sterile gloves	• Gown • Disposable covers for shoes • Disposable covers for head and facial hair • Face mask • Sterile gloves If using RABS → disposable gloves inside of gauntlet gloves	• Gown • Disposable covers for shoes • Disposable covers for head and facial hair • Face mask • Sterile gloves If using RABS → disposable gloves inside of gauntlet gloves	• Low-lint garment with sleeves that fit snugly around the wrists and an enclosed neck (e.g., gown or coverall) • Low-lint covers for shoes • Low-lint cover for head that covers the hair and ears, and if applicable, cover for facial hair • Low-lint face mask • Sterile powder-free gloves • If using a RABS, (i.e., a CAI or CACI), disposable gloves should be worn inside the gloves attached to the RABS sleeves. Sterile gloves must be worn over the gloves attached to the RABS sleeve

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⟨797⟩ Revisions

Minimum Garbing Requirements

Revised Chapter – Category 3
If the facility compounds Category 3 CSPs, additional garbing requirements must be continuously met in the buffer room in which Category 3 CSPs are prepared. The following additional garbing requirements must be followed in the buffer room where Category 3 CSPs are prepared for all personnel regardless of whether Category 3 CSPs are compounded on a given day: 1. Do not allow any exposed skin in the buffer room. (i.e., face and neck must be covered). 2. All low-lint outer garb must be sterile, including the use of sterile sleeves over gauntlet sleeves when a RABS is used. 3. Disposable garbing items must not be reused, and laundered garb must not be reused without being laundered and resterilized with a validated cycle. 4. The facility's SOPs must describe disinfection procedures for reusing goggles, respirators, and other reusable equipment.

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⟨797⟩ Revisions

Microbiological Air and Surface Monitoring

	2008 Last Official Chapter	2015 Revision Proposal	2018 Revision Proposal	2019 Remanded Chapter	Revised Chapter
Viable air sampling	Every 6 months	Monthly	Every 6 months	Every 6 months	**Category 1 & 2:** Every 6 months **Category 3:** Monthly
Surface sampling	Periodically	Monthly	Monthly	Monthly	**Category 1 & 2:** Monthly **Category 3:** Weekly

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Alternative Method

Sterility testing is not required for Category 1 CSPs (see *Table 12*). For Category 2 CSPs assigned a BUD that requires sterility testing (see *Table 13*) and all Category 3 CSPs, the testing must be performed according to ⟨71⟩ or a validated alternative method (see ⟨1223⟩) that is noninferior to ⟨71⟩ testing.

If an alternative method is used for sterility testing, the method must be validated (see ⟨1223⟩) and demonstrated to be suitable for that CSP formulation.

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⟨797⟩ Revisions

Category 2 CSP BUD Limits

Preparation Characteristics		Storage Conditions		
Compounding Method	**Sterility Testing Performed & Passed**	**Controlled Room Temperature (20°–25°)**	**Refrigerator (2°–8°)**	**Freezer (−25° to −10°)**
Aseptically processed CSPs	No	Prepared from one or more nonsterile starting component(s): 1 day	Prepared from one or more nonsterile starting component(s): 4 days	Prepared from one or more nonsterile starting component(s): 45 days
		Prepared from only sterile starting components: 4 days	Prepared from only sterile starting components: 10 days	Prepared from only sterile starting components: 45 days
	Yes	30 days	45 days	60 days
Terminally sterilized CSPs	No	14 days	28 days	45 days
	Yes	45 days	60 days	90 days

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⟨797⟩ Revisions

Category 3 CSP BUD Limits

Preparation Characteristics	Storage Conditions		
Compounding Method	Controlled Room Temperature (20°–25°)	Refrigerator (2°–8°)	Freezer (-25°–10°)
Aseptically processed, sterility tested, and passing all applicable tests for Category 3 CSPs	60 days	90 days	120 days
Terminally sterilized, sterility tested, and passing all applicable tests for Category 3 CSPs	90 days	120 days	180 days

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Considerations of Category 3

- Undergo sterility testing, supplemented by endotoxin testing when applicable
- Have more requirements than Category 2 CSPs for personnel qualification
- Use of sterile garb
- More frequent use of sporicidal disinfectants
- Frequency of environmental monitoring
  - Exp. Surface sampling with each batch of extended BUD, and at least weekly
- Batch size is limited to 250 final use units
- BUD assigned to a Category 3 CSP must be supported by stability data obtained using a stability-indicating analytical method that is able to distinguish the active ingredient from its degradants and impurities (e.g., by forced degradation studies) and quantify the amount of the active ingredient

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USP ⟨800⟩ Potentially Applicable 11/1/2023

Cleaning Step	Purpose	Example Agents
Deactivation	Render compound inert or inactive	As listed in the HD labeling or other agents which may incorporate Environmental Protection Agency (EPA)-registered oxidizers (e.g., peroxide formulations, sodium hypochlorite, etc.)
Decontamination	Remove HD residue	Materials that have been validated to be effective for HD decontamination, or through other materials proven to be effective through testing, which may include alcohol, water, peroxide, or sodium hypochlorite
Cleaning	Remove organic and inorganic material	Germicidal detergent
Disinfection (for sterile manipulations)	Destroy microorganisms	EPA-registered disinfectant and/or sterile alcohol as appropriate for use

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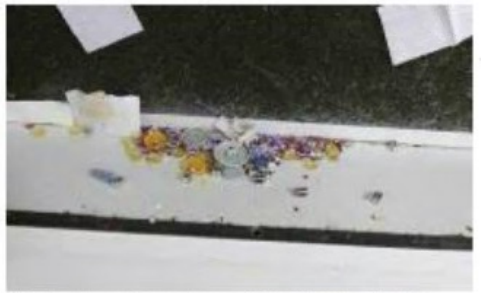
FDA – Insanitary Conditions

- Doesn't mean "dirty ingredients"
- Potential to become contaminated
  - Microbial growth
  - From environment
  - Other, unintended chemicals
  - Construction in the area without adequate controls
  - Standing water or evidence of water leakage
  - Quality of ingredients (what grade?)

Visible mold contamination on ceiling tiles removed from room where compounding occurred.



Medical supply waste and dust built up in the pre-filter of an ISO-5 hood where drugs were compounded.

Dead cockroach on the floor of a compounding room.

Exposed insulation in ceiling above doorway to a cleanroom.

FDA public records on Insanitary Conditions Presentation - 2016

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Contamination from Handling

Handling bulk drug substances or drug products that are hazardous, sensitizing, or highly potent (e.g., hormones) with inadequate controls to prevent cross-contamination. This includes:

- Inadequate dedication, segregation, and containment (e.g., a powder-containment hood) of a suite, room, or piece of equipment based on risk
- Inadequate cleaning of rooms, work surfaces, and equipment (e.g., utensils), including spills
- Inadequate segregation of HVAC systems (as appropriate for the operation)
- Inadequate control over the movement of personnel and materials

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Observation Examples

OBSERVATION 1
You produced hazardous drugs without providing adequate cleaning of work surfaces and cleaning of utensils to prevent cross-contamination.

Specifically,

a) Your firm does not use a strong oxidizer capable of deactivating hazardous drug products to prevent cross-contamination of work surfaces and non-dedicated, shared equipment used in the production of hazardous drug products containing testosterone, progesterone, estriol and/or estradiol.

b) Your firm has not established the use of (b) (4) is adequate to remove drug product residues to prevent contamination from shared equipment used in the production of hazardous drug products containing testosterone, progesterone, estriol and/or estradiol.

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Observation Examples

OBSERVATION 2
Non-microbial contamination was observed in your production area.

Specifically,

a) On 12/1/2022 during the initial walk through of the facility, I observed an unknown white powder-like substance on two separate (b) (4) capsule machines. According to your non-sterile technician (b) (6) no production of capsules occurred that day and the last time the machines were used to produce capsules were on 11/7/2022 to produce (b) (4) 25mg capsules and on 11/29/2022 to produce Ivermectin 18mg capsules. Your (b) (4) capsules machines are not dedicated equipment and are used to produce hazardous drug products containing progesterone.

b) On 12/1/2022, I observed a white jar with a white screw cap top that had a yellowish unknown residue on the cap with a greasy oily texture placed in a cabinet used to store clean non-dedicated equipment ready for use in the production of your topical drug products (creams and gels) containing hazardous drug substances such as testosterone, progesterone, estriol and/or estradiol.

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Observation Examples

Vermin was observed in an area immediately adjacent to your production area.

Specifically,

Your firm failed to adequately control pest activity in your facility.

A: On 10/12/2022, during a walkthrough of your facility, we observed insect activity on a (b) (4) mat at the entrance to the hazardous compounding area.

B: On 10/13/2022, we observed a flying insect in the dispensing area adjacent to non-sterile

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Observation Examples

Your firm produced drugs while construction was underway in an adjacent area without adequate controls to prevent contamination of the production environment and product.

Specifically,

A. The Hazardous Area (Room # 8-206A), containing the ISO 5 Classified Biological Safety Cabinet, where aseptic production is performed. The Ante room entrance door is located in a common hallway accessible to employees. On 02/07/2020, we observed approximately 2 to 3 maintenance personnel, performing maintenance on the ceiling tiles in the hallway, while construction was being performed approximately 5 feet from the entrance of the Ante room door.

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Other Bodies

- OSHA
- DEA
- Joint Commission
- State Boards
- Centers for Medicare & Medicaid Services (CMS)

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Summary of USP and FDA

- USP
  - Training and documentation
  - Make it right
  - Keep it clean
  - Protect patient and personnel
- FDA
  - Start with clean
  - Keep it clean
  - Protect the public

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Master Formulation Records (MFR)

- Detailed Record
- Required for each unique formulation
- Details recorded on compounding record
- Changes must be approved and documented

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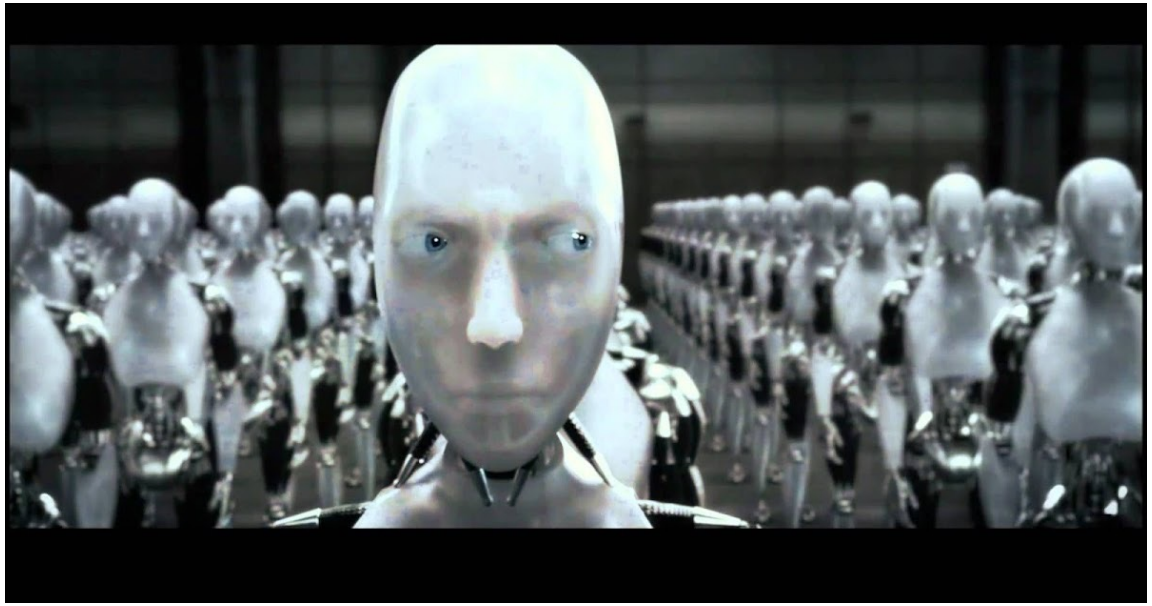
Compounding Record (CR)

- Documents compounding of each product
- Must be reviewed prior to release
- Who reviewed and when?
- Traceability of all components



Standard Operating Procedures

You want me do:

- What?
- When?
- Where?
- Why?
- How?

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Standard Operating Procedure

- A standard operating procedure (SOP) is a step-by-step, repeatable process for any routine task.
  - Documentation that prevents stress, mistakes and miscommunication.
  - SOPs ensure reliability, efficiency and consistently hitting quality standards in regular work activities.

    - Noun; established or prescribed methods to be followed routinely for the performance of designated operations or in designated situations – Merriam Webster

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USP ⟨1163⟩

- SOPs are itemized instructions that describe when a task will be performed, how a task will be performed, who will perform the task, why the task is necessary, any limitations in performing the task, and what action to take when unacceptable deviations or discrepancies occur.
- A standard operating procedure (SOP) is a set of step-by-step instructions compiled by an organization to help workers carry out complex routine operations. SOPs aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations.

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Base vs. Salt Calculations

- Lidocaine – the “base” chemical
- Lidocaine Hydrochloride – the “salt” of Lidocaine
- The chemical may come as a salt form, but have the strength expressed as the base.

MONOGRAPHS ▸ USP ▸ *LIDOCAINE HYDROCHLORIDE INJECTION*

Lidocaine Hydrochloride Injection

» Lidocaine Hydrochloride Injection is a sterile solution of Lidocaine Hydrochloride in Water for Injection, or a sterile solution prepared from Lidocaine with the aid of Hydrochloric Acid in Water for Injection. It contains not less than 95.0 percent and not more than 105.0 percent of the labeled amount of lidocaine hydrochloride ($C_{14}H_{22}N_2O \cdot HCl$).

Example using Lidocaine HCl Injection, USP Monograph from USP Online Reference.

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Base/Salt Calculation Example

Lidocaine 4 mg/mL Injection Solution

4 mg x 100 mL = 400 mg (0.4 gm)

0.4 gm x 1.23 = 0.492 gm

LIDOCAINE HYDROCHLORIDE USP MONOHYDRATE	0.492 g
SODIUM CHLORIDE USP GRANULAR	20 g
Benzalkonium Chloride 1% (W/V)/Water for Injection (USP <51> Study) (6037)	1 ml
Water for Injection, USP	q.s. 100 ml

Note: Lidocaine Hydrochloride Monohydrate 1.23 milligrams is equivalent to Lidocaine 1 milligram.

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