

## Guide to the Use and Management of Controlled Substance Dilutions

- What does this guide cover?
  - What is a dilution and how long is it good for
  - How to calculate dilution concentrations from stock containers
  - How to label a dilution container
  - How to manage online inventory
  - Online and paper usage logs

### *What is a dilution? How long is it good for?*

- A dilution refers to process of adding additional solvent to a solution to decrease the concentration.
- **Always** follow UAB ARP veterinary recommendations for dilution concentration and dosages in animals.
- Dilution samples (DS) expire on the 30<sup>th</sup> day following dilution from original stock containers.
- Expired controlled substances (CS) are not allowed for use in animal research according to IACUC and UAB ARP protocols.
- Federal law strictly regulates the disposal of CS. Return all expired CS including dilution samples to EH&S for disposal.
- Use the UAB CSP Microsoft Bookings to schedule an appointment for disposal:  
<https://outlook.office365.com/owa/calendar/UAB387225@uab365.onmicrosoft.com/bookings/>

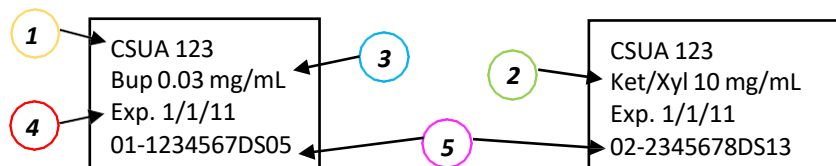
### *How do I calculate dilution concentrations from stock containers?*

- Diluting one stock container:
  - Use the following formula to calculate the volume of CS stock needed:  
**(volume of CS stock needed) X (CS stock concentration) = (final volume) X (needed DS concentration)**
  - After the needed stock volume of the CS stock needed is calculated, add diluent (e.g., sterile saline) to reach the final volume.
  - Example:
    - Buprenorphine stock concentration = 0.3 mg/mL
    - Buprenorphine needed DS concentration = 0.03 mg/mL
    - Final volume = 10 mL
    - Plug in formula: **(volume of CS stock needed) X (0.3 mg/mL) = (10 mL) X (0.03 mg/mL)**
    - Volume of buprenorphine stock needed = 1 mL
    - Final volume is 10 mL. Add 9 mL of diluent to reach final volume.
- Diluting two or more stock containers:
  - Drugs such as xylazine are not controlled substance but are often used together.
  - Some drugs **cannot** be mixed. Always follow UAB ARP veterinary recommendations for dilution concentration and dosages in animals.
  - Use the following formula to calculate the volume of CS stock needed:  
**(volume of drug A needed) X (drug A stock concentration) = (final volume of mixture) X (needed drug A DS concentration) + (volume of drug B needed) X (drug B stock concentration) = (final volume of mixture) X (needed drug B DS concentration)**

- After the volume of the needed stock volume needed is calculated, mix amounts with diluent (e.g., sterile saline) to reach the final volume.
- Example:
  - Ketamine (Drug A)
    - Ketamine stock concentration = 100 mg/mL
    - Ketamine needed DS concentration = 10 mg/mL
    - Final volume = 20 mL
    - Plug in formula: (volume of Drug A needed) X (100 mg/mL) = (20 mL) X (10 mg/mL)
    - Volume of ketamine stock needed: 2 mL
  - Xylazine (Drug B)
    - Xylazine stock concentration = 100 mg/mL
    - Xylazine needed DS concentration = 1 mg/mL
    - Final volume = 20 mL
    - Plug in formula: (volume of Drug B needed) X (100 mg/mL) = (20 mL) X (1 mg/mL)
    - Volume of xylazine stock needed: 0.2 mL
  - Mix 2 mL of ketamine and 0.2 mL of xylazine with 17.8 mL of sterile diluent to reach final volume.
  - Administering a 5 mL dose of the compounded dilution will deliver 50 mg of ketamine and 5 mg of xylazine.
- Compounded doses have to be calculated to the weight of the animal prior to administration.

### How do I label a dilution container?

- Dilution containers must be appropriately labelled with the dilution ID information. Dilution ID must match the Usage Log ID for dilution containers.
- Dilution ID is the stock container ID followed by the dilution sample number (starting with DS01). Continue number for each dilution made from the same stock container (e.g., DS02, DS03, DS04, etc.).
- The label needs the following information: 1) CSUA number, 2) substance name (substance abbreviations are acceptable), 3) concentration, 4) expiration date, and 5) dilution ID.
- For a compounded dilution, include the name of all substances.
- See examples below:



### How do I create dilutions on my inventory in the CSUA Web Application?

1. Log into the CSUA Web Application with your BlazerID and password here <https://www.uab.edu/ehs/controlled-substances> using the link for existing users.
2. On the main dashboard, click the green “Dispensing/Use” tab.
3. Click the blue “+ Add New Use”.

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Department of Occupational Health & Safety CSUA Main-Dashboard **Controlled Substance Use Authorization (CSUA)**

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click a button below to view the associated list

Buttons: [Prescribed](#) [Protocols](#) [Storage Location](#) [Dispensing/Use](#) [Stock Materials](#) [Inventory](#)

**Controlled Substance Use Log Items** [+ Add New Use](#)

UAB #	Use Date	Used By	Substance Name	Description	Used	Hub Loss	Total Used

4. Select the substance by clicking the drop-down box and selecting the stock container ID the dilution is being made from.
5. Select the use type by clicking the drop-down box and selecting "Dilution". *\*Note: If you were logging a usage, you would have selected "Administration".*
6. Click submit.

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Department of Occupational Health & Safety **Controlled Substance Use Authorization (CSUA)**  
 5. Dispensing/Use Log Entry

[Instructions go here](#) [Return to CS Front](#)

**CONTROLLED SUBSTANCE DISPENSING/USE LOG ENTRY FORM**

USED BY: [Text Field]  
 USE DATE (MM/DD/YYYY): 8/24/2021  
 Select the Substance: 01-2253480 : Pentobarbital Injection, 390 mg/ml, 250 ml (176.8 ml) [4](#)  
 Select the Use Type: DILUTION [5](#)  
 Submit [6](#)

7. Enter the amount of substance used in mL.
8. Select to calculate for hub loss.
9. Enter number of needle changes.
10. Enter final volume of dilution in mL. Remember to use the dilution concentration calculations for the correct final volume.
11. Click submit.

**CONTROLLED SUBSTANCE DISPENSING/USE LOG ENTRY FORM**

Stock Substance Selected: 01-2253480 - Pentobarbital Injection, 390 mg/ml, 250 ml  
 Use Type: Dilution  
 Amount of Substance Used: [Text Field] mL [7](#)  
 Calculate Hub Loss?: YES [8](#)  
 # of needle changes?: [Text Field] [9](#)  
 Final Volume of Dilution: [Text Field] mL [10](#)  
 Submit [11](#)


12. Dilution will now appear on the online inventory.

**Usage Logs for dilutions**

- Both paper usage logs and online usage logs must be maintained and kept up-to-date at all times. The amount of controlled substances in the laboratory must equal the amount recorded on both the paper usage logs and online usage logs.

- The paper usage logs for stock containers are pre-printed with the container ID, expiration date, substance, schedule, strength, and initial amount. The user must document:
  - Date of use
  - Amount dispensed
  - Remaining balance after deducting syringe hub loss (0.1 ml per withdrawal)
  - Name of the individual dispensing and signature
  - Reason for use/animals/protocol on the paper usage log
- The paper usage log for the stock container must be the original log sheet provided by EH&S.
- Usage is tracked on a per dose or use basis. Each amount drawn from the stock container must be logged on the stock container usage log.
- Then create a dilution usage log with the applicable dilution ID.
- Visit <https://www.uab.edu/ehs/controlled-substances/cs-managing-inventory> for a sample stock usage log, sample dilution usage log, and blank usage log.
- Make sure the top section of the Usage Log is completed.

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### Controlled Substance Usage Log

University of Alabama at Birmingham  
 Occupational Health and Safety  
 Controlled Substances Program  
 Phone: (205) 934-2487  
 Fax: (205) 934-7487

Principal Investigator:  Department:  CSUA#

*Usage is tracked on a per dose (use) basis and the log balance must match the physical balance at all times. Complete one log sheet for each container. Record total quantity to the nearest metric unit weight or the total number of units finished form. Make additional copies of this form if needed.*

Product:  Expiration Date:  Container ID:

Substance:  Schedule:  Container Type:  Finished Form:

Strength:  Initial Amount:  on Date

- After the top section is completed, the user must document exactly the same as the stock container usage log. Track every usage on a per dose or use basis.
- Remember to record usage in to the CSUA Web Application.