

## Basic Toxicology Lab Stations

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funded by the National Institute of Environmental Health Sciences Core Center Grant P30 ES06694-08.  
Based on Tox-in-a-Box™ developed by the Community Outreach and Education Program at the University of Washington  
<http://depts.washington.edu/ceeh/Outreach/outreach.html> and SEPUP “Determining Threshold Limits.”

### Supply List

#### Station 1: SEPUP Determining Threshold Limits: Taste Test for Salt Solution

1. Salt Solutions: 1000 ppm, 2000 ppm, 3000 ppm, 4000 ppm, 5000 ppm
2. Overhead – “Bar Chart”
3. Data Sheet – “Bar Chart”
4. Markers
5. Instructions

#### Station 2: Tox-in-a-Box: Appendix A (Body Size)

1. Small vials
2. Larger containers
3. Food coloring
4. Gloves
5. Aprons
6. Instructions

#### Station 3: Tox-in-a-Box: Appendix C (Dose-Response)

1. Weigh boats
2. Pipettes
3. 0.1 N HCl
4. Buffer solution BPB solution: 25 ml of 0.1 N NaOH, 50 mg BPB
5. Buffer Solution: 100 ml distilled water, 15 drops BPB solution, 3 drops of pH 10 buffer
6. Waste container
7. Data sheets (one per group)
8. Overhead – “Data Sheet”
9. Gloves
10. Aprons
11. Instructions

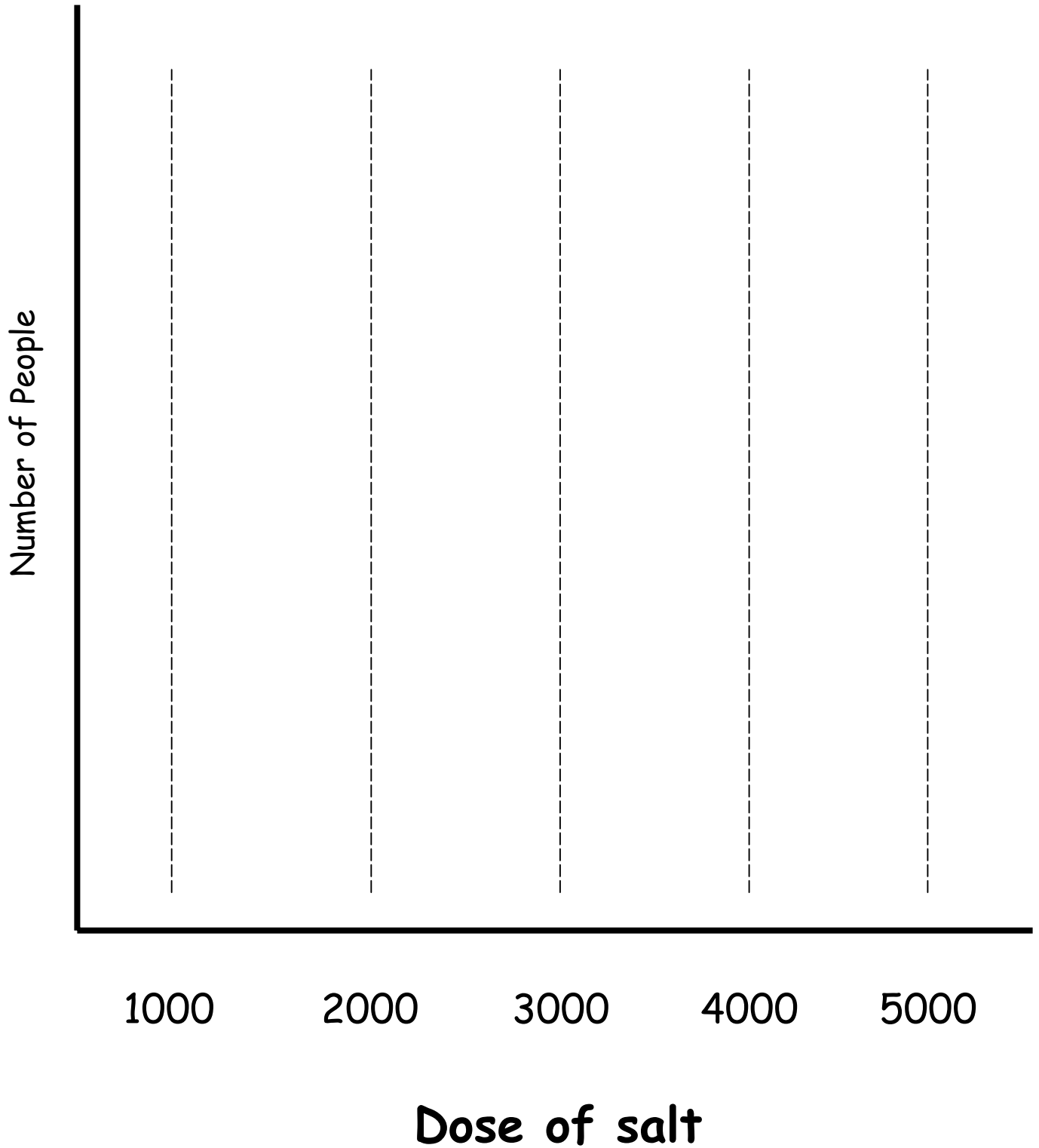
#### Station 4: Tox-in-a-Box: Appendix D (Variability in Response)

1. Distilled water
2. Clear cups (or beakers)
3. Spoons
4. BPB solution (see station 3 supplies)
5. 0.3 N HCl
6. Pipettes
7. Waste container
8. Instructions

### Station 1: Threshold Limits

1. Each person needs to taste 1-3 drops of each of the five salt solutions. Taste them in ascending order (1000 ppm, 2000 ppm, 3000 ppm, 4000 ppm, 5000 ppm).
2. Record on the Bar Chart at what concentration you began to taste the salt. Place an X on the lowest tick mark at your concentration.
3. We will discuss the class results after everyone has cycled through this station. But discuss the following:
  - a. If the point at which you began to taste the salt indicated the point at which death occurs from this “toxic substance”... how does it relate to the following terms?
    - acute toxicity
    - threshold limit
    - lethal dose 50 (LD<sub>50</sub>)
  - b. If the point at which you began to taste the salt indicated the point at which a health effect occurred from this “toxic substance”... how does it relate to the following terms?
    - threshold limit
    - individual susceptibility
    - dose-response
4. Also, discuss the following questions:
  - a. Would tasting the water be a good way to determine the amount of salt in our drinking water?
  - b. If we cannot taste salt in water does that mean there are none present?
  - c. How can we find out if our water supply is OK for people to drink?

# Threshold Limit Value for Tasting Salt in Water (dose at which you begin to taste the salt)



## Station 2: Body Size

1. Do this activity as though you are giving a demonstration to your class.
2. Decide among your group who will be the teacher & students volunteers.
3. Set the Scene: Imagine that the plastic cups are the bodies of adults/teens Ask the class how much of us is water (70%). Have them imagine that the food coloring is a chemical they are getting exposed to.
4. Have a volunteer from the class add one drop, three drops, and five drops of food coloring to each of the plastic cups and then stir them with the spoon. Ask the students what happened to cause this response.
5. Next, have a volunteer from the class add one drop, three drops, and five drops of food coloring to the small, clear vials, close the vials and shake. The smaller vials, which can represent a small child, will be a much darker shade of food coloring compared to the plastic cups. Point out to the students that the same amount of chemical (food coloring) had a much greater effect on the small child (small vial) than on the adult (large cup). Suggestion: you can also use beakers of two different sizes – 100ml and 500ml or 10ml and 100ml beakers to show the difference.
6. After you are done with the demonstration, discuss how the activity relates to the following:
  - dose-response
  - individual susceptibility

### **Clean-up**

Rinse out your cups and leave them on the table when you are done.

### Station 3: Dose-Response

Set up standards: One 100ml beaker which has only buffer solution (so it is blue) and one that has buffer solution and quite a bit of acid (so it very yellow) – this way the participants can see the range of colors.

Suggestion: Have one person stir while another person adds the acid. The third person can record the data.

#### Experiment

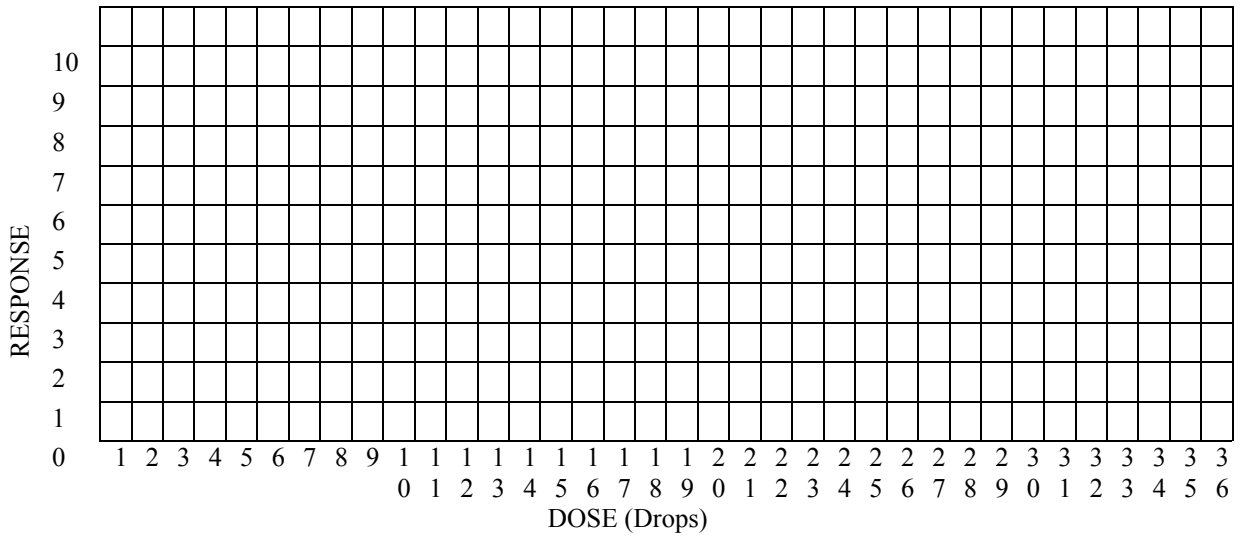
1. Fill the weigh boat with the buffer solution until it is about  $\frac{1}{4}$  full. This represents a living organism.
2. Begin adding drops of the 0.1 N HCl, one by one, to the weigh boat. This represents the toxic substance.
3. Stir the solution in the weigh boat after each drop.
4. After each dose (drop) and stirring, record the magnitude of the response (0 = all blue, 5 = purple-reddish, 10 = all yellow) for each dose increment in Column B. I
5. Continue adding doses until the color has changed completely to yellow (i.e. until the organism dies).
6. Once the data are collected, plot dose (X-axis) versus response (Y-axis).
7. Mark the “threshold” on the plot (the dose just below which a change was first noted) – below this is the **No Observable Effect Level** or NOEL.

#### Clean-up

1. Pour the spent solution from the weigh boat into the container labeled “waste.”
2. Throw away the used weigh boat.

Station 3: Dose Response Worksheet

Column A: DOSE (Drops)	Column B: RESPONSE	Column A: DOSE (Drops)	Column B: RESPONSE
1		15	
2		16	
3		17	
4		18	
5		19	
6		20	
7		21	
8		22	
9		23	
10		24	
11		25	
12		26	
13		27	
14		28	



#### Station 4: Individual Susceptibility

1. Fill 4-5 clear plastic cups with distilled water.
2. Add a few drops of 0.3 HCl into one of the cups.
3. Set the stage: Imagine that you are a student coming to this lab station (or that you are presenting this as a demonstration to your class). The students are not aware that there is HCl in one of the cups. Inform the students that each cup represents a different person. A potentially toxic substance will be added to the cups (i.e. the people are being exposed).
4. Add three drops of BPB solution to each cup and stir.
5. The cup with the HCl will respond differently (it will turn yellow) and represent a sensitive individual.
6. You can brainstorm with your group why some people are more sensitive or resistant than others to chemicals.

#### Clean-up

1. Pour the spent solutions from the cups into the container labeled "waste."
2. Throw away the used weigh boats.
3. Wash the spoons thoroughly.