

Toxic Cleanse: How Close is the Dose?

Section I: Lab scenario

A supplement company is selling an “all natural” Toxic Cleanse product in retail stores nationwide. The dosage on the bottle is listed as “ Take 1 ½ teaspoons toxic cleanse daily as needed”. The company isolated the product from the exoskeleton of an insect from the amazon rain forest. The suspected active ingredient is structurally identical to a drug the FDA rejected during clinical trials. During these trials, the ED₅₀ and LD₅₀ were determined.



The ED₅₀ = 6mg drug/kg body weight and the LD₅₀ = 18 mg drug/kg body weight.

- Values and conversion factors needed:

0.454 kg = 1 lb

d_{H2O} = 1 g/mL

1 teaspoon = 5 mL

Section II. Equipment and Procedure

- **Equipment:**

Plastic weighing boats (3/student group (of two))

Bottle of all natural Toxic Cleanse (shared with lab bench)

Oral Syringes

Medicine cups

Plastic spoons

— One of each per lab group

- **Procedure:**

A. Weigh empty weighing boat

1) Obtain and label three clean, dry weighing boats with #1, #2, and #3.

2) Using a balance, tare the balance (to make the mass read 0.000g), weigh each boat, and record the mass in column A on your spoon dosage data table (section IIIA). Clean up the balance area before you leave.

3) Copy these weights of your empty weighing boats into column A for the medicine cup (section IIIB) and syringe (section IIIC) dosage data tables.

Check it out: All Column A values should be filled in when you are finished with this step.

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Column A, weigh boat #1 should contain the same value in spoon, med cup, and syringe data table. Same is true for the other weigh boat values.

B. Using a spoon to measure a dosage of Toxic Cleanse

4) Using a clean, dry plastic spoon, measure a dose (always 1 ½ teaspoons) of Toxic Cleanse into a clean, dry weighing boat labeled #1. Repeat the measurement, placing a dose of the Toxic Cleanse into the weigh boats labeled #2 and #3.

5) Using the balance, tare the balance (repeat between each measurement!) and weigh each of the weigh boats containing the Toxic Cleanse dose. Record these values on your data sheet.

C. Using a medicine cup to measure a dosage of Toxic Cleanse

6) Empty the Toxic Cleanse dose in the weighing boats into the sink and rinse the boat with distilled water. Dry each boat with a paper towel.

7) Using a clean, dry medicine cup, measure a dose (again, 1 ½ teaspoons) of Toxic Cleanse into a clean, dry weighing boat labeled #1. Repeat the measurement, placing a dose of the Toxic Cleanse into the weigh boats labeled #2 and #3.

8) Using the balance, tare the balance (repeat between each measurement!), weigh each of the weigh boats containing the Toxic Cleanse dose. Record these values on your data sheet.

D. Using a syringe to measure a dosage of Toxic Cleanse

9) Empty the Toxic Cleanse dose in the weighing boats into the sink and rinse the boat with distilled water. Dry each boat with a paper towel.

10) Using a clean, dry syringe, measure a dose of Toxic Cleanse listed on the label into a clean, dry weighing boat labeled #1. Repeat the measurement, placing a dose of the Toxic Cleanse into the weigh boats labeled #2 and #3.

11) Using the balance, tare the balance (repeat between each measurement!) and weigh each of the weigh boats containing the Toxic Cleanse dose. Record these values on your data sheet.

Name: _____

Lab Section: _____

****Turn in pages 3-6 next week****

Section III. Data Sheet

IIIA. Spoon Dosage Data

| | Column A Empty Boat (g) | Column B Boat+Spoon dose (g) | Mass of Spoon Dose (Column B - Column A) |
|--------------------------------|----------------------------|------------------------------------|---|
| Weigh boat #1 | | | |
| Weigh boat #2 | | | |
| Weigh boat #3 | | | |
| Average mass of spoon dose (g) | | | |
| Range of Spoon dose mass (g) | | | |

IIIB. Medicine Cup Dosage Data

| | Column A Empty Boat (g) | Column B Boat+Med cup dose (g) | Mass of Med cup Dose (Column B - Column A) |
|----------------------------------|----------------------------|--------------------------------------|---|
| Weigh boat #1 | | | |
| Weigh boat #2 | | | |
| Weigh boat #3 | | | |
| Average mass of med cup dose (g) | | | |
| Range of med cup dose mass (g) | | | |

IIIB. Syringe Dosage Data

| | Column A Empty Boat (g) | Column B Boat+Syringe dose (g) | Mass of Syringe Dose (Column B - Column A) |
|----------------------------------|----------------------------|--------------------------------------|---|
| Weigh boat #1 | | | |
| Weigh boat #2 | | | |
| Weigh boat #3 | | | |
| Average mass of Syringe dose (g) | | | |
| Range of Syringe dose mass (g) | | | |

Section IV. Results (show your work on all calculations. Report values to 2 decimal places)

- 1) Convert the 1.5 teaspoon dose to mL. Show your work.

- 2) Calculate the expected mass of the 1.5 teaspoon dose. Show your work.

- 3) Using the dosage weights in your data sheet, calculate the volume in mL of each measuring method's average and range.

| | Spoon | Med Cup | Syringe |
|-------------------------|--------------|----------------|----------------|
| Average vol (mL) | | | |
| High vol (mL) | | | |
| Low vol (mL) | | | |
| Range in (mL) | | | |

- 4) Looking at the data in your datasheet and in #2 and #3 above, which measuring method produced the most accurate average? Which measuring method produced the most precise mass measurements? Explain.

Section V. Going Deeper Questions

- 5) The concentration of the active ingredient of Toxic Cleanse in one dose is 325mg. A 180 lb man takes a dose of Toxic Cleanse. Calculate this man's dosage in mg ToxC1/kg body weight below. Compare to the listed ED₅₀ and LD₅₀, what can you say about this dose for this dude.

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6) Now, you learn of a mother who gave her 20 lb toddler a dose of Toxic Cleanse because the baby was fussy. Calculate the toddler's dosage in mg ToxC1/kg body weight below. Compare to the listed ED₅₀ and LD₅₀, what can you say about this dose for this child.

7) Using the ED₅₀ and LD₅₀ values and the Toxic Cleanse dose concentration, calculate the weight limit in lbs for a) a person to receive an effective dose of Toxic Cleanse, and b) a person to avoid overdosing on Toxic Cleanse. (This question can be tough. Hint: Start with the ED₅₀ or LD₅₀ and calculate the kg body weight, then convert to lbs.)

8) What was your single largest variation in volume from your datasheet (in mL)? Calculate how much drug would be provided in that difference. Given what you have discovered about the drug, do you think this difference in dose would matter?

8) Given what you know about all natural Toxic Cleanse, what are your concerns, recommendations, etc.