What does the 50% refer to?

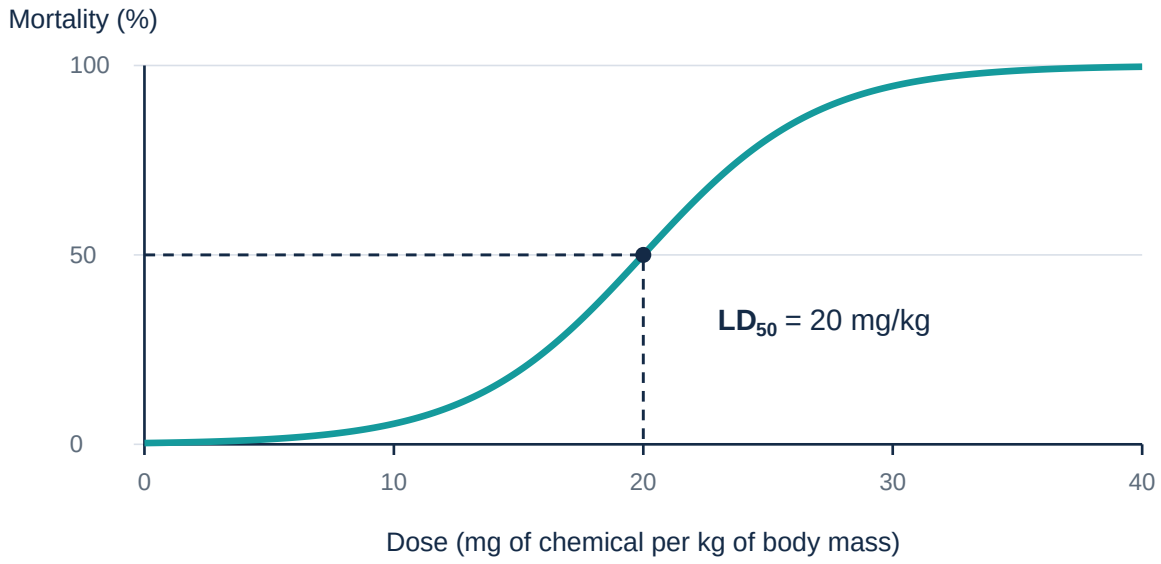
LD stands for lethal dose. The subscript 50 identifies the proportion of a test population that dies, not the amount of chemical in a container.

LD_{50} The estimated dose lethal to 50% of a test population of a particular species under stated conditions.

It is a population-level estimate of acute lethality, not a prediction of exactly which individuals will die.

1. LOCATE THE MEDIAN LETHAL DOSE

Illustrative curve only; graph-reading bridge to Topic 8.13.



2. READ ACROSS, THEN DOWN

Start at 50% mortality on the vertical axis. Move across to the curve, then down to the dose axis. Here the estimated LD_{50} is 20 mg/kg. The curve summarizes a population response; 50% does not mean that each organism is "half dead."

Definition: College Board APES CED, EIN-3.A.1.
Population interpretation and dose units: CCOHS, What is a LD50 and LC50?

Scope: College Board AP Environmental Science CED, Topic 8.12, p. 171.

Keep the units attached

The worked examples use fictional substances and test data for arithmetic practice. These values are not safety limits or instructions for handling chemicals.

1. DOSE PER BODY MASS IS NOT TOTAL CHEMICAL MASS

$$\text{Dose (mg/kg)} = \frac{\text{chemical mass (mg)}}{\text{body mass (kg)}}$$

Example: 6 mg associated with a 0.30 kg test organism gives
6 mg ÷ 0.30 kg = 20 mg/kg.
Dividing by body mass expresses the amount per kilogram.

2. REARRANGE TO FIND THE CORRESPONDING MASS

$$\text{Chemical mass (mg)} = \text{dose (mg/kg)} \times \text{body mass (kg)}$$

Suppose a reported LD_{50} is 12 mg/kg and the stated test organism has a mass of 0.25 kg. Multiply, so the kg units cancel:

$12\ \text{mg/kg} \times 0.25\ \text{kg} = 3\ \text{mg}$

This corresponds to the reported dose; it does not guarantee an individual death.

3. CONVERT FIRST; THEN COMPARE

A fictional organism has a mass of 250 g. A chemical mass of 5 mg is associated with that organism. What is the dose in mg/kg?

$$250\ \text{g} \times (1\ \text{kg} / 1{,}000\ \text{g}) = 0.250\ \text{kg}$$

$5\ \text{mg} \div 0.250\ \text{kg} = 20\ \text{mg/kg}$

Check: 5 ÷ 250 = 0.020 gives mg/g, not mg/kg.
A unit conversion error can change a toxicity comparison by a factor of 1,000.

mg/kg convention: CCOHS, WHMIS Glossary, LD50.
Math approach: College Board APES CED, Topic 8.12, Skill 6.A.

Scope: College Board AP Environmental Science CED, Topic 8.12, p. 171.

Lower dose, greater acute toxicity

Compare the same biological endpoint under comparable test conditions. An LD_{50} value is useful evidence, but it is not a complete assessment of environmental risk.

1. COMPARE FICTIONAL SUBSTANCES A AND B

Assume the same species, exposure route and observation period.

A LD_{50} = 5 mg/kg

Lower median lethal dose

B LD_{50} = 50 mg/kg

Higher median lethal dose

B requires 50 / 5 = 10 times the dose to reach the same 50% mortality endpoint. A therefore has greater acute lethal toxicity in this comparison. This ratio does not mean A creates ten times the real-world risk.

2. REPORT THE TEST CONTEXT

Useful context includes the species, route (such as oral or dermal), dose units and observation period. Body-mass normalization does not make different species biologically identical. Supporting distinction: LC_{50} measures a lethal concentration in a medium such as air or water over a stated exposure time, not a dose in mg/kg.

3. DO NOT CONFUSE TOXICITY WITH EXPOSURE

Supporting risk context: harm depends on the hazardous properties and on exposure, including amount, route, frequency and duration. A lower LD_{50} alone cannot rank the risks of two real situations without information about how organisms encounter each substance.

4. KNOW WHAT THE NUMBER DOES NOT SHOW

LD_{50} is not a safe threshold. Effects can occur below it, and it does not by itself describe chronic, reproductive or other nonlethal harm. Do not use a test-species value as a human safety limit.

Test conditions and LC50: CCOHS, What is a LD50 and LC50?
Exposure, endpoints and uncertainty: US EPA, Conducting a Human Health Risk Assessment.

Scope: College Board AP Environmental Science CED, Topic 8.12, p. 171.