

Toxicology Activity

Name:

Chapter 17: Human Health and Environmental Toxicology
From Mrs. Naylis (Stony Creek HS)

Environmental pollution can cause serious problems for plants, animals, and humans. There are obvious toxic substances we know of such as nuclear waste, radon, mercury in the water, etc. Finding ways to reduce toxicity levels is critically important to keeping our world and ourselves safer.

Task 1: You need to read Chapter 17 - you can take notes if you choose. You will be responsible for knowing some of the key vocabulary for your exam. We will discuss some in class, but unless you have specific questions I am not going to go over every part.

However, there are other toxic substances that we handle or are exposed to on a daily basis. We are often unaware of the degree to which they are toxic. Many household items that we deal with on a regular basis are toxic materials, but we don't usually think of that.

The commonly used term to describe acute ingestion toxicity is LD₅₀. LD means Lethal Dose and the subscript 50 means that the dose was acutely lethal to 50% of the animal to whom the chemical was administered under controlled laboratory conditions. The test animals (usually mice or rats) are given specific amounts of the chemical in either one oral dose or by a single injection and are then observed for 14 days.

Since LD₅₀ values are measured from zero up, the lower the LD₅₀ the more acutely toxic the chemical. Therefore a chemical with an oral LD₅₀ of 500 would be much less toxic than a chemical with an LD₅₀ of 5. LD₅₀ values are expressed as milligrams per kilogram (mg/kg) which means mg of chemical per kg of body weight of the animal. mg/kg is the same as ppm. For example, if the oral LD₅₀ of the insecticide parathion is 4, a dose of 4 parts of parathion for every million parts of body weight would be lethal to at least half of the test animals.

An MSDS (material Safety Data Sheet) is a document for each chemical with information on all the physical and chemical properties for that chemical, as well as information on reactions and safe disposal of the chemical waste. The following information can be found

- Identity of the organization responsible for creating the sheet and the date of issue
- The material's identity, including its chemical and common names
- Hazardous ingredients
- Exposure limits
- Physical and chemical hazards and characteristics
- Health hazards
- Emergency and first aid procedures
- Spill and disposal procedures
- Precautions and safety equipment

Task 2: Using your OWN MASS in kg, figure out how many total g would be required to kill 50% of perfect duplicates of you! Be careful about the units. For your reference a penny weights about 3000 mg or 3 g. You don't need to show work for all of these problems, but write out ONE complete example of your conversions below the table so that I know you did it. Remember, everyone's answers will be slightly different – don't be lazy figure it out for yourself.

Task 3: Find a MSDS for an ingredient in some household substance you have (such as toothpaste, shampoo, junk food additives, etc) and give its LD₅₀. Don't use any of the ones listed below. Find out how many grams of the substance would be lethal to you.

Task 4: Now that you know how many grams of certain substances can be lethal to you, CHOOSE 5 of the following substances and figure out how many of a certain product you would have to have to kill you. For example, How many Monsters would you have to have to hit your lethal dose of caffeine (or starbucks for that matter).

Substance (source or product)	LD ₅₀ (mouse or rat) mg/kg or g/kg	LD ₅₀ for you (g/person)
Disodium EDTA (Secret)	2000 mg/kg	
Benzaldehyde (cherry flavor)*	4.2 mg/kg	
Tetrahydrocannabinol (THC from marijuana)*	110 mg/kg	
Ethyl acetate (cherry flavor)*	6100 mg/kg	
Propylene glycol (cherry flavor)*	20 g/kg	
Caffeine (Mountain Dew)*	0.13 g/kg	
Malic acid (sour candy)*	1.6 g/kg	
Methanol (wood alcohol)*	5628 mg/kg	
Nicotine (through mouth)*	190 mg/kg	
Botulinum toxin (bacteria)*	3×10^{-8} mg/kg	
Potassium nitrate (fertilizer)	190 mg/kg	
Sodium fluoride (toothpaste)	52 mg/kg	
Parathion (pesticide)	6.0 mg/kg	
Vx (nerve gas)	2×10^{-2} mg/kg	
Tetrodotoxin (poison from puffer fish)	334×10^{-6} g/kg	
Diazinon (ant killer dust)	0.076 g/kg	
Ephedrine	0.600 g/kg	
Gamma hydroxybutyrate (date rape drug)	2.0 g/kg	
Your Household substance:		

*natural substance

Just a hint: Realize that if you are trying to figure out how much marijuana you would need to be lethal, you will not be able to do it on the school computers. I also don't want you telling your parents that you need to learn about pot in my class! However, the fact that it is a natural substance makes it interesting for our purposes