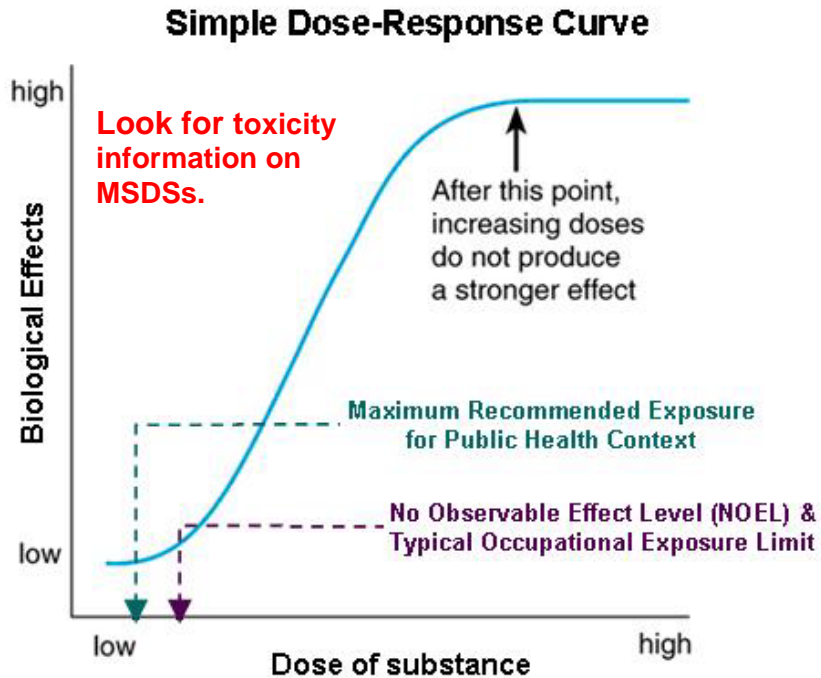


"All things are poison and nothing (is) without poison; only the dose makes that a thing is no poison."

-- The most basic principle of toxicology, stated by Paracelus, a 16th century Swiss chemist.

Practically every substance on earth (including water and Vitamin C) can kill you if it's concentrated enough in your stomach or your bloodstream: *The Dose Makes the Poison*



Expressed in more modern terms: A substance can produce the harmful effect associated with its **toxic properties only** if it reaches a **susceptible biological system** within your body in a **sufficient concentration** (a high enough dose). The toxic effect of a substance increases as the exposure (or dose) to the susceptible biological system increases. For all chemicals there is a dose-response curve – a range of doses between the extremes of no effect and 100% response (toxic effect).

All chemical substances will exhibit a toxic effect given a large enough dose. If the dose is low enough, even a highly toxic substance will cease to cause a harmful effect. The toxic potency of a chemical is thus ultimately defined by the dose (the amount) of the chemical that will produce a specific response in a specific biological system.

<http://learn.caim.yale.edu/chemsafe/references/dose.html>

Acute and Chronic Health Effects

Acute health effects are characterized by **sudden and severe exposure** and rapid absorption of the substance. Normally, a single large exposure is involved. Acute health effects are often reversible. Examples: carbon monoxide or cyanide poisoning.

Chronic health effects are characterized by **prolonged or repeated exposures** over many days, months, or years. Symptoms may not be immediately apparent. Chronic health effects are often irreversible. Examples: lead or mercury poisoning, cancer.

Local vs. Systemic Health Effects

A **local effect** refers to an adverse health effect that takes place **at the point or area of contact**. The site may be skin, mucous membranes, the respiratory tract, gastrointestinal system, eyes, etc.

Systemic effect refers to an adverse health effect that takes place at a **location distant from the body's initial point of contact** and presupposes absorption has taken place. Substances with systemic effects often have "target organs" in which they accumulate and exert their toxic effect. Examples: arsenic effects to the blood, nervous system, liver, kidneys, and skin; benzene effects to the bone marrow.

Some substances that cause systemic effects are also **cumulative toxins**. These substances tend to build up in the body as a result of numerous chronic exposures. The effects are not seen until a critical body burden is reached. Example: heavy metals such as lead.

When exposure occurs to several substances simultaneously the resultant systemic toxic effect may be significantly greater in combination than the additive toxic effect of each substance alone. This is called a synergistic or potentiating effect. Example: exposure to alcohol and chlorinated solvents; or smoking and asbestos. *A Call to Arms for Medical Toxicologists: The Dose, Not the Detection, Makes the Poison* *Int J Med Toxicol* 2003; 6(1): 1

http://www.ijmt.net/ijmt/6_1/6_1_1.htm

Physiological Classification of Toxic Responses

Toxic substances can be classified according to the physiological effects they have on the human body. This classification scheme separates toxic substances into the following categories:

Class	Effect
Irritant:	Causes inflammation of the skin and mucous membranes (skin, eyes, nose, or respiratory system).
Corrosive:	A material that can destroy human tissue. Includes both acids and bases and may be a solid liquid or gas. Most common toxic material encountered in the laboratory.
Asphyxiant:	A material that deprives tissue of oxygen and causes suffocation by displacing oxygen or interfering chemically with oxygen absorption, transport, or utilization.
Anesthetic:	Depresses the central nervous system Example: alcohols, halogenated hydrocarbons
Hepatotoxin:	Causes liver damage. Example: carbon tetrachloride
Nephrotoxin:	Causes kidney damage. Example: chloroform, mercury, dimethyl sulfate
Neurotoxin:	Affects the nervous system. Example: mercury, lead, carbon disulfide
Hematopoietic toxin:	affects the cellular components of blood or its ability to function Example: benzene, xylene, CO, cyanides
Pulmonary toxin:	Irritates or damages the lungs. Example: asbestos, silica ozone. chromium
Reproductive toxins:	Causes impotence or sterility in men and women. Example: lead, dibromodichloropropane
Carcinogen:	A material which can cause cancer. Example: asbestos, Bis-chloromethyl ether, benzene, acrylonitrile
Mutagen:	Anything which causes a change in the genetic material of a living cell. Many mutagens are also carcinogens.
Teratogen:	A material which interferes with the developing embryo when a pregnant female is exposed to that substance. Example: lead, thalidomide

Transition Toolbox Meeting - Week 6, Day 2: *Motor Vehicle Safety*

“Law enforcement agencies nationwide crack down on safety belt violators as new report details the 18 percent who still fail to obey the law.”

Report profiles one out of five who "still don't get it" – young males, people who drive in rural areas, and pick-up truck drivers.

Washington, D.C. – Despite the highest safety belt-use rate ever recorded in the U.S., 48 million Americans still fail to buckle up, according to a recently released report by the National Highway Traffic Safety Administration (NHTSA), titled "Research Note: Restraint Use Patterns Among Fatally Injured Passenger Vehicle Occupants". ***In 2004, the majority (55%) of the occupants of passenger vehicles (passenger cars, light trucks, vans, and SUVs) killed in motor vehicle crashes were unrestrained.*** When examined more closely, the data shows that the proportion of unrestrained ***fatalities was higher among males, on rural roadways, in pickup trucks and SUVs, in single-vehicle crashes, and in the age group of 8 to 44 years old.***

Passenger Vehicle Occupant Fatalities by Year & Restraint Use

Calendar Year	Not Used		Used		Total	
	Number	Percent	Number	Percent	Number	Percent
2000	19,391	60	12,834	40	32,225	100
2001	19,051	59	12,992	41	32,043	100
2002	19,272	59	13,571	41	32,843	100
2003	18,196	56	14,075	44	32,271	100
2004	17,575	55	14,118	45	31,693	100

Passenger Vehicle Occupant Fatalities in 2004 by Age Group and Restraint Use

Age Group	Not Used		Used		Total	
	Number	Percent	Number	Percent	Number	Percent
0-7	311	41	440	59	751	100
8-15	683	62	425	38	1,108	100
16-20	3,174	62	1,961	38	5,135	100
21-24	2,373	66	1,222	34	3,595	100
25-34	3,209	64	1,843	36	5,052	100
35-44	2,632	62	1,622	38	4,254	100
45-54	2,093	54	1,752	46	3,845	100
55-64	1,281	48	1,407	52	2,688	100
65 +	1,786	34	3,405	66	5,191	100
Unknown	51	68	23	32	74	100
Total	17,575	55	14,118	45	31,693	100

Passenger Vehicle Occupant Fatalities in 2004 by Vehicle Body Type and Restraint Use

Passenger Vehicle Body Type	Not Used		Used		Total	
	Number	Percent	Number	Percent	Number	Percent
Passenger Cars	9,446	49	9,645	51	19,091	100
SUVs	2,953	62	1,782	38	4,735	100
Pickups	4,031	69	1,770	31	5,801	100
Vans	1,108	54	928	46	2,036	100
Other Light Trucks	19	64	11	36	30	100
Total	17,575	55	14,118	45	31,693	100

NHTSA's National Center for Statistics and Analysis

Of course, the important point is whether you get it!

