

Environmental Health

By: Hana Taha

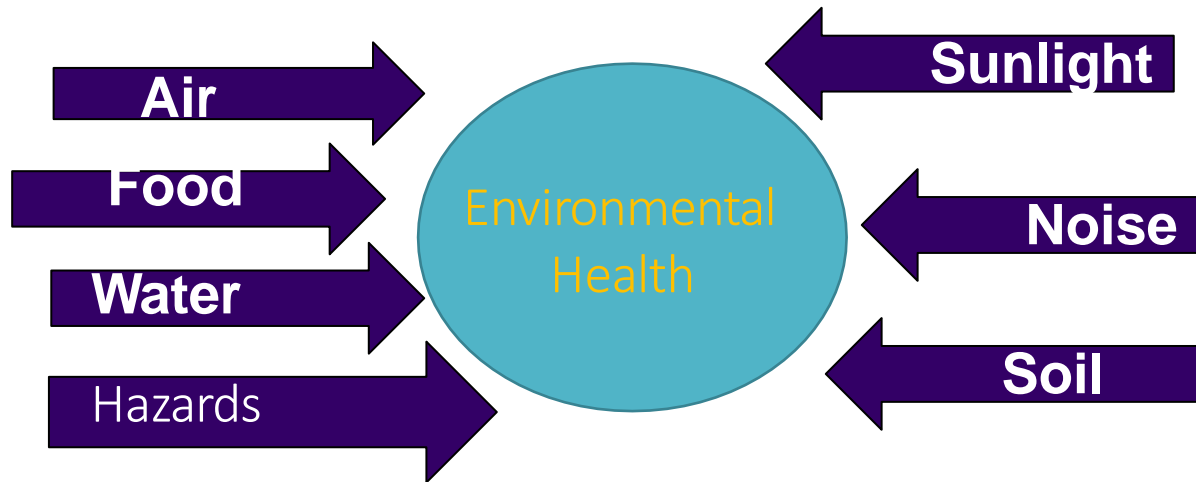


Environment

- Environment is all the physical, chemical, and biological factors external to a person.
- Environment” in this context, means the natural elements like air, water, soil, and all the physical, chemical, biological and social features of our surroundings
- Globally, environment is a key determinant of health and well-being.
- Food and water sanitation, lead exposure, air pollution and indoor pollution from solid fuels are among the leading contributors to the global burden of disease.



Environmental Health



The study of how the environment affects our health.



Hazards

Every day, we encounter things in our environment that can benefit us or hurt us.

- Some of these things are important for keeping us healthy, such as oxygen, food or medicines.
- Things in the environment that are harmful are called **hazards**.
- Hazards include things like chemicals, radiation, disease-causing bacteria, loud noises and even stress.
- Hazards can be natural or man-made.



Why Is Environmental Health Important?

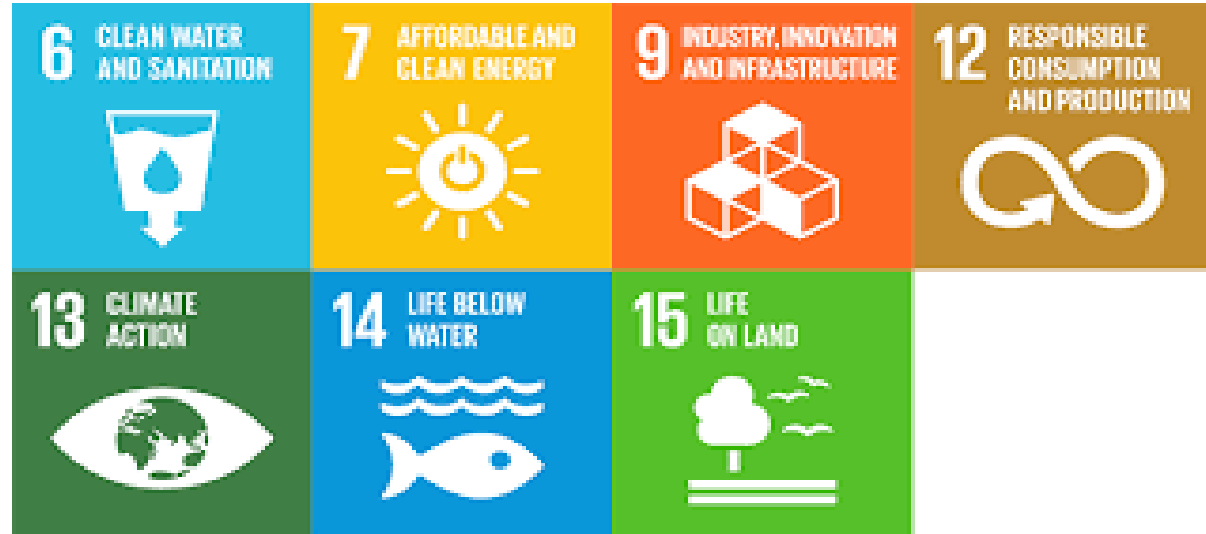
- Maintaining a healthy environment is central to increasing the quality of life and years of healthy life.
- Globally, nearly 24 percent of all deaths can be attributed to environmental factors which is roughly 13.7 million deaths a year.



Environmental SDGs: ■ In 2015, the world leaders agreed on the 2030 Agenda and its 17 Sustainable Development Goals (SDGs) to carry forward the unfinished agenda of the Millennium Development Goals (MDGs).

Environmental SDGs

- GOAL 6: Clean Water and Sanitation
- GOAL 7: Affordable and Clean Energy
- GOAL 9: Industry, Innovation and Infrastructure
- GOAL 12: Responsible Consumption and Production
- GOAL 13: Climate Action
- GOAL 14: Life Below Water
- GOAL 15: Life on Land



- Protecting the environment can lead to positive outcomes that would cascade across many of the SDGs.

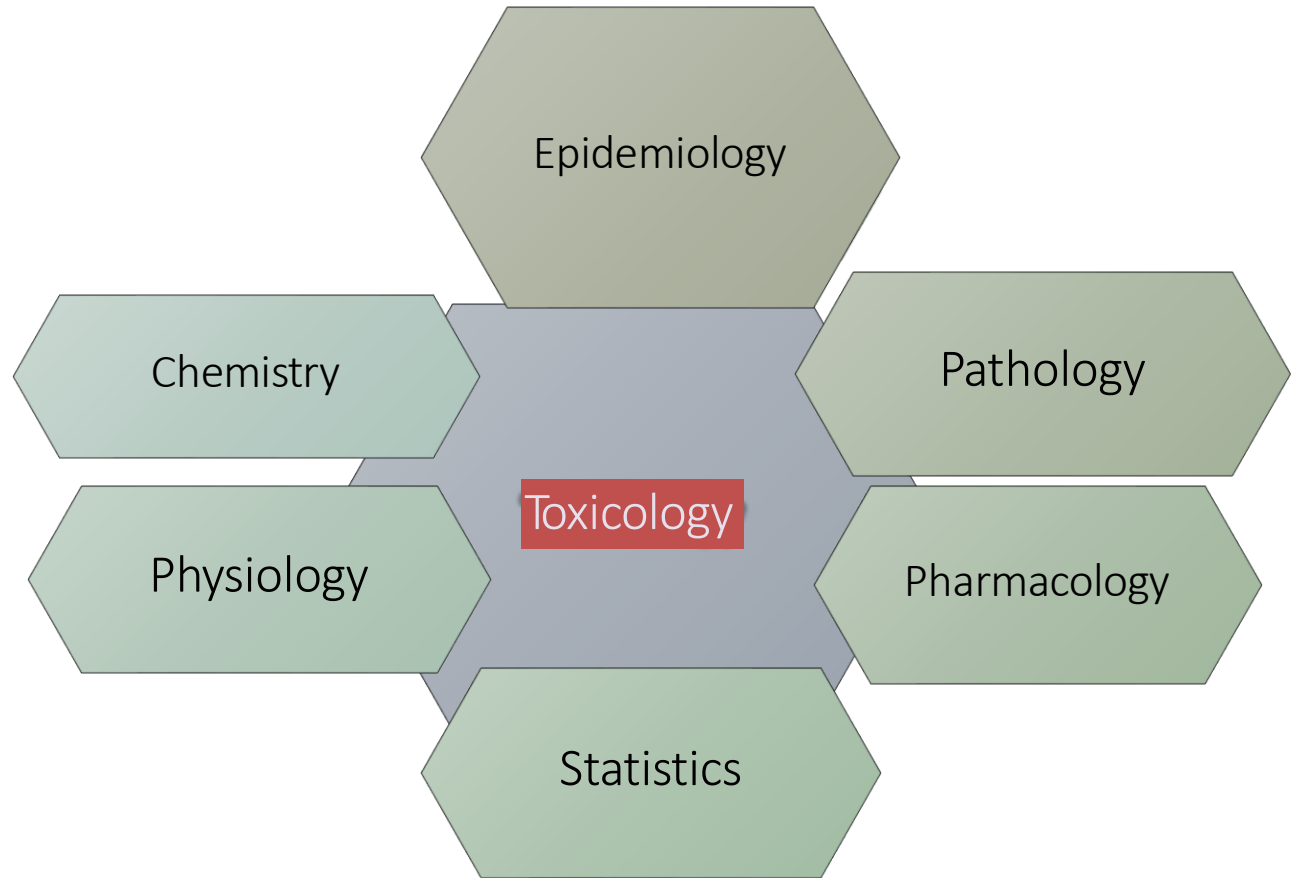


Toxicology

- The traditional definition of toxicology is "the science of poisons."
- It aims to understand how various agents can cause harm to humans and other organisms.
- Toxicology is the study of the adverse effects of chemicals or physical agents on living organisms.
- Adverse effects may occur in many forms, ranging from immediate death to indirect changes not realized until months or years later.



**Toxicology
overlaps with
other
disciplines**



Relationship between epidemiology and toxicology

There is a strong relationship between epidemiology and toxicology.

Both disciplines seek to explore the causes of human disease and they lean on each other to support the propositions of causality.

Toxicologists and epidemiologists alike spend considerable time and effort characterizing the relationship between the presumed causal agent and a response

They have the same fundamental considerations of the evidence-based analysis that takes place by toxicologists in labs and by epidemiologists in population-based studies.



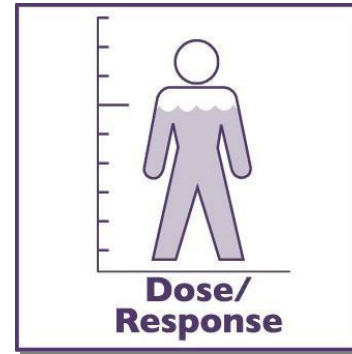
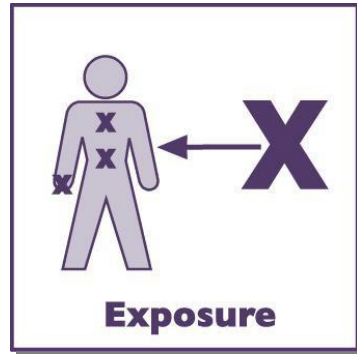
Environmental toxicology

Environmental Toxicology is the study of how environmental hazards, such as natural and human-made chemicals, can enter our bodies and make us sick.

For example, the impact of industrial fumes on humans who are exposed to these hazards.



Core Concepts




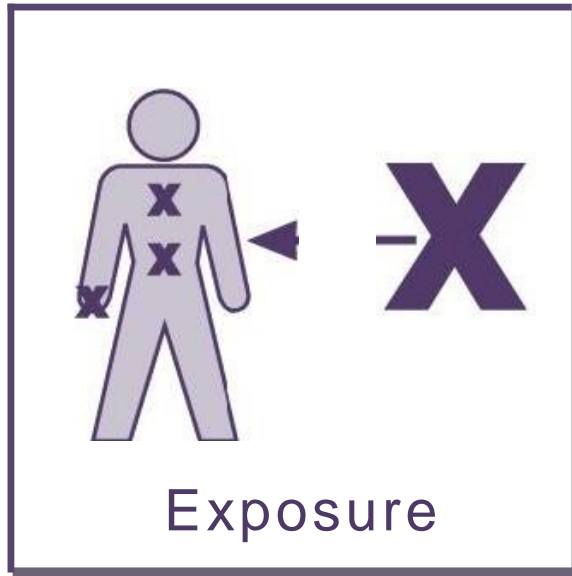
A toxic substance is

- A material which has toxic properties.
- It may be a discrete toxic chemical or a mixture of toxic chemicals.
- Lead chromate is a discrete toxic chemical.
- Gasoline is a toxic substance rather than a toxic chemical in that it contains a mixture of many chemicals.
- Asbestos is a toxic material that does not have an exact chemical composition but comprises a variety of fibers and minerals.

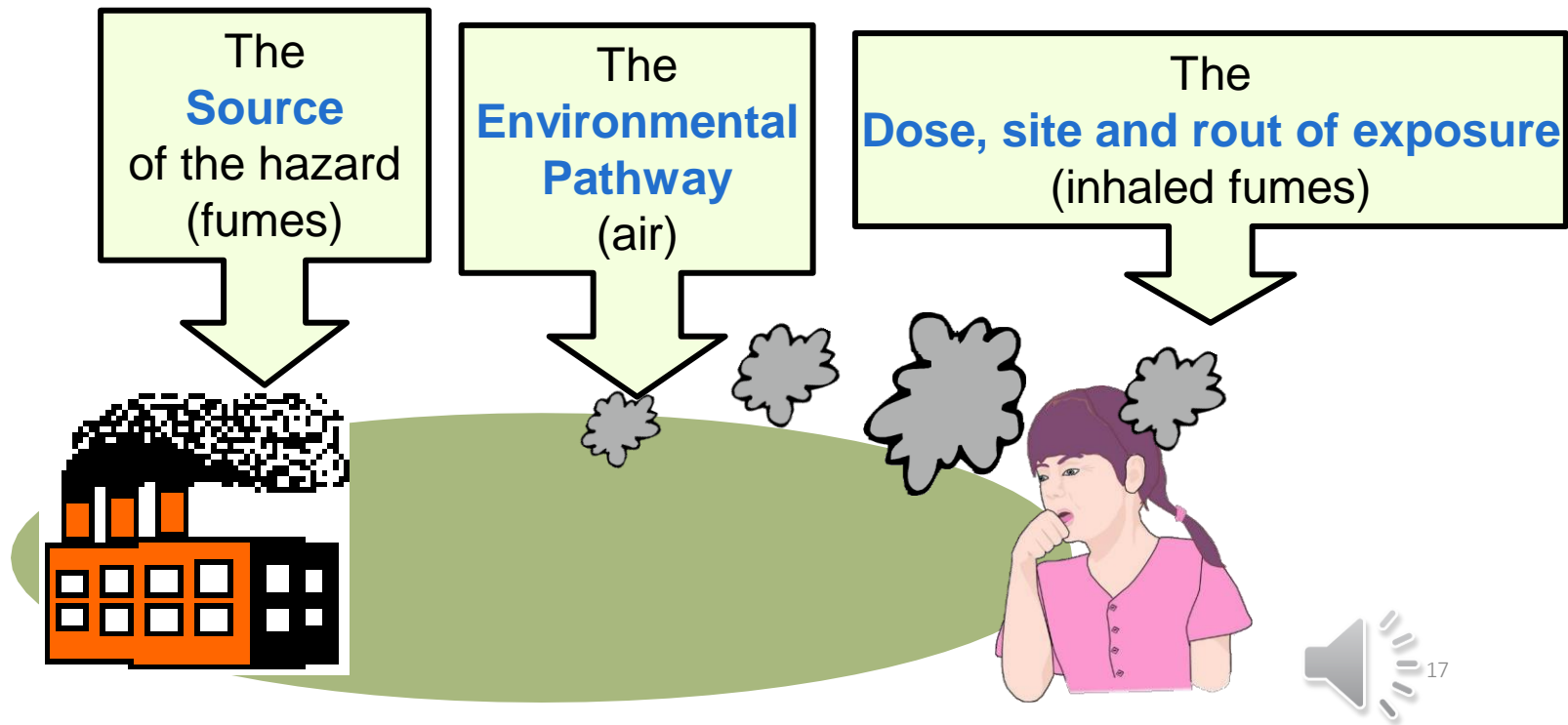


Toxic substances may be organic or inorganic in composition

Organic toxins	<ul style="list-style-type: none">• Substances that are originally derived from living organisms• They are mostly obtained from natural sources but can be synthesized (man-made)
Inorganic Toxins	<ul style="list-style-type: none">• Chemicals (minerals) that are derived from non-living sources. 



Exposure is the total amount of a hazard that comes in direct contact with the body.



Dose

The amount of the hazard that enters the body.

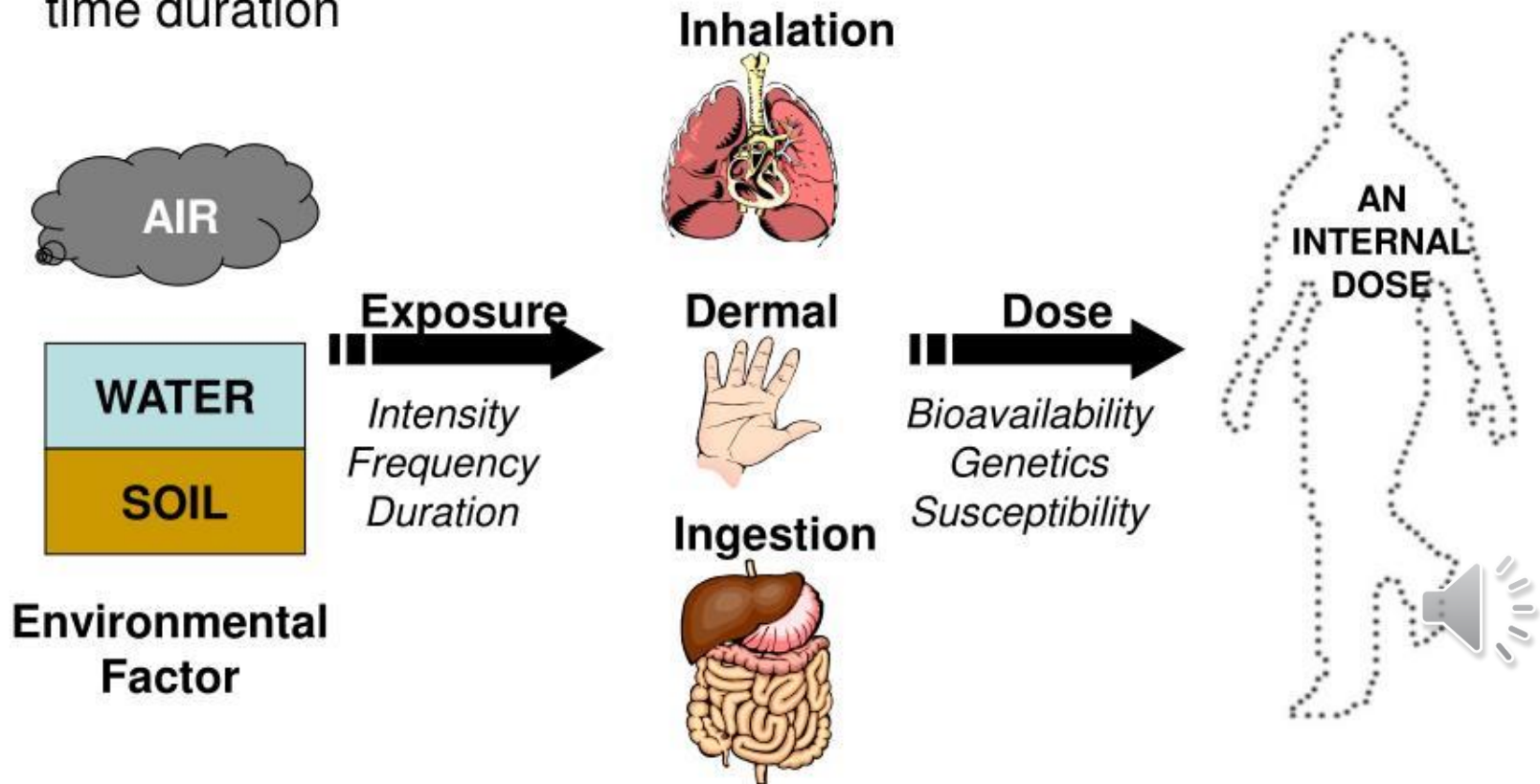
The amount that gets into the body (the dose) depends on many factors, including:

1. How long we are exposed
2. How often we are exposed, and
3. Body weight



Exposure vs Dose

- **Exposure** – refers to the concentration of an agent at the boundary between individual and environment
- **Dose** – the amount of the agent that enters a target in a specified time duration



Terms describing the duration of exposure

Acute: Usually, a single exposure for less than 24 hours

Sub-acute: Repeated exposure for a month or less

Sub-chronic: Repeated exposure for more than 1 month to 3 months

Chronic: Repeated exposure for more than 3 months



Exposure and response

Patterns of exposure

acute or high dose

chronic low dose



Patterns of response

clinically manifest

subtle and/or long-term

- cancer
- reproductive effects
- neurodegenerative disease
- immunologic susceptibility
- ...

epidemiology



Ranking of the Relative Speed of Effect according to the Site and Rout of Exposure

Site	Route	Relative Speed of Effect ^a
Bloodstream	Intravenous	+++++++
Lungs	Inhalation	+++++++
Other	Intraperitoneal	+++++
Other	Subcutaneous	++++
Other	Intramuscular	+++
Other	Intradermal	++
Gastrointestinal	Ingestion (oral route)	+
Skin	Dermal	




What are the main routes of Environmental hazards intake?

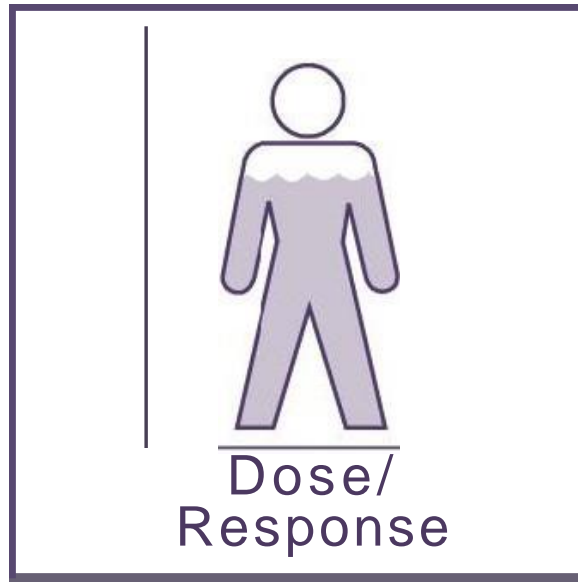
Inhalation:

Breathing. When chemicals enter the body through this route of exposure, they can get stuck in the lungs and/or be taken up into the bloodstream.

Ingestion:

Swallowing (usually by eating or drinking). When chemicals enter the body through this route of exposure, they can easily be taken up into the bloodstream.

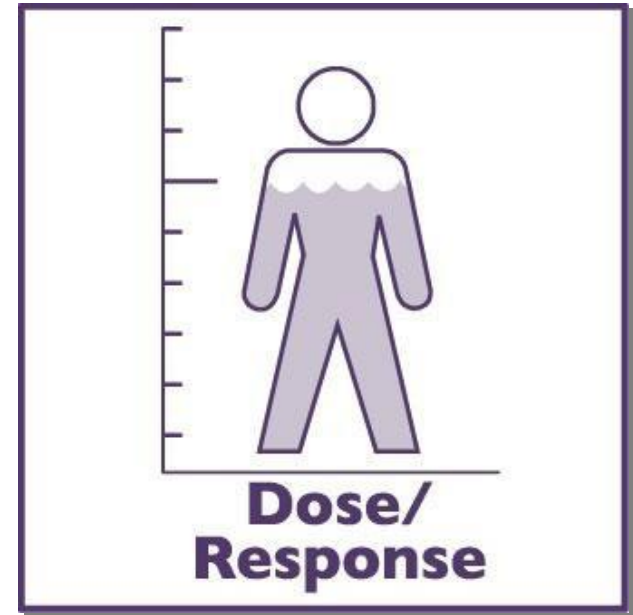
- **Dermal Absorption:** Absorbing a chemical through any part of the skin, including the eyes. When chemicals come in contact with the skin, they can sometimes enter the bloodstream through this route of exposure.
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The dose-response relationship

The dose you receive can influence how your body responds to a hazard.

Generally, the higher the dose, the more severe the response.

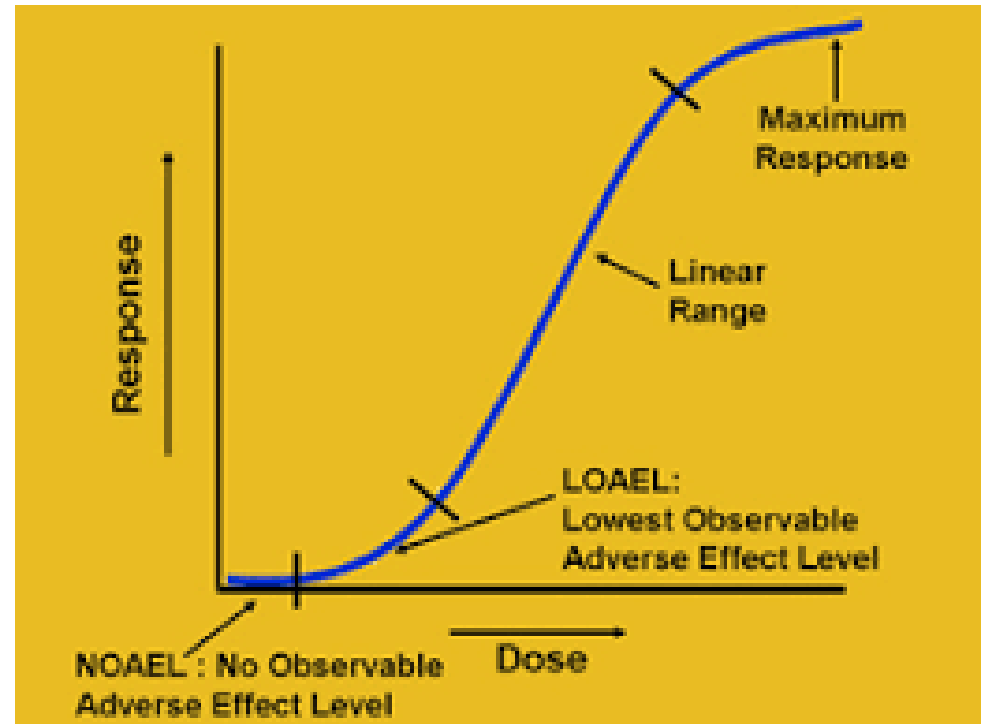


The dose-response curve

The dose-response curve normally takes the form of a sigmoid curve.

For most effects, small doses are not toxic. The point at which toxicity first appears is known as the threshold dose level.

From that point, the curve increases with higher dose levels.





Individual Susceptibility

“Some people are more likely than others to get sick when they are exposed to environmental hazards. This might be because of their genetics, body size, age, gender or general health. Example: children, elderly, pregnant women, immunocompromised . This is called their individual susceptibility.”





In addressing environmental, health, and safety problems, regulatory bodies need to assess the risks associated with specific health and safety hazards. This includes analyzing the costs and benefits of alternative ways of reducing those risks



Air pollution

- Air pollution : is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere.
- Household devices, motor vehicles, industrial facilities and forest fires are common sources of air pollution.
- Pollutants of major public health concern include particulate matter, carbon monoxide, ozone, nitrogen dioxide and sulfur dioxide.
- Outdoor and indoor air pollution cause respiratory and other diseases, which can be fatal.



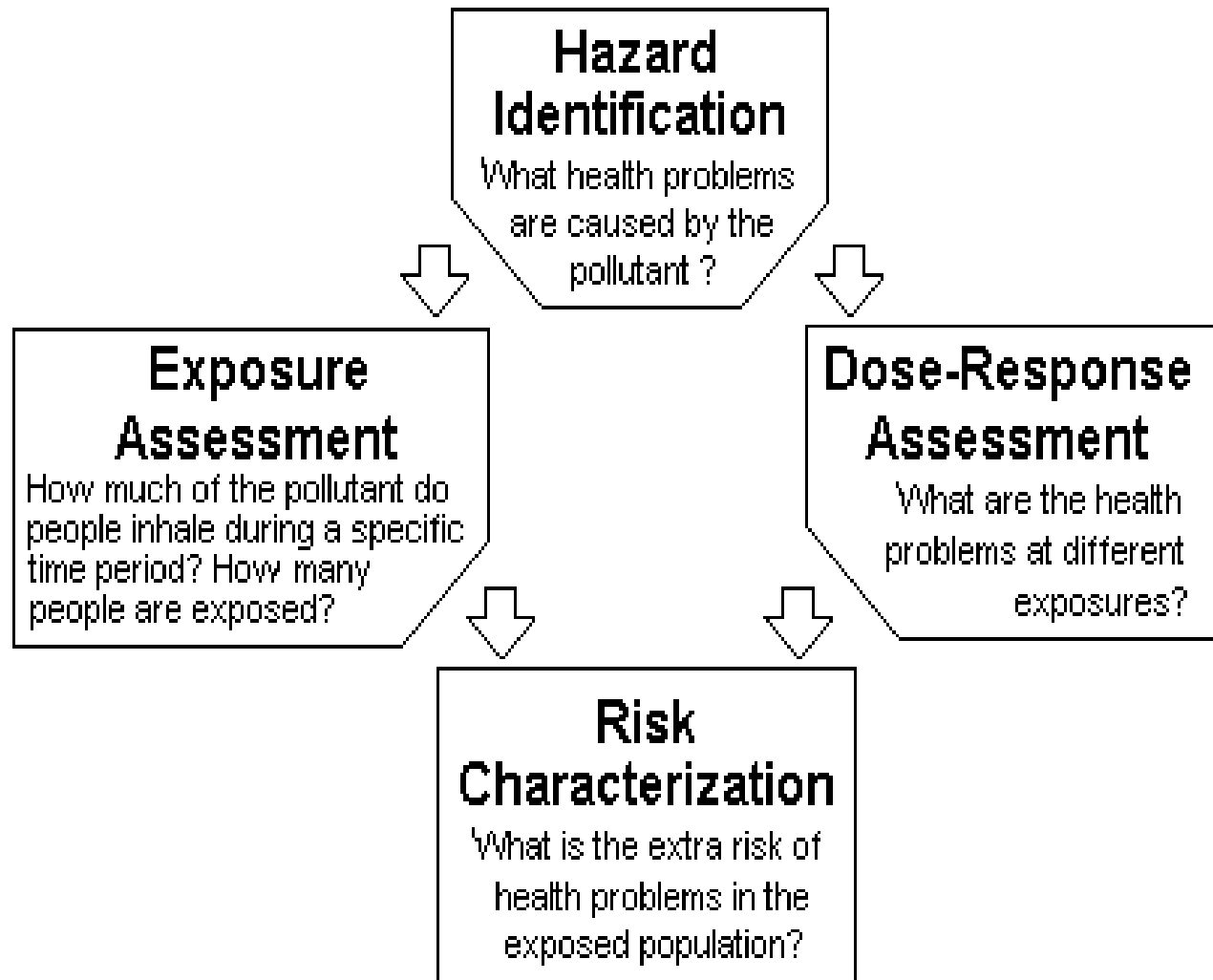
Sources of air pollution

- ◆ Most air toxics originate from human-made sources, including:
 1. mobile sources (e.g., cars, trucks, buses) .
 2. stationary sources (e.g., factories, refineries, power plants).
 3. Indoor sources (e.g activities such as cleaning).
- ◆ naturally occurring sources such as windblown dust, and volcanic eruptions .



Human health risk assessment

The 4-Step Risk Assessment Process



Social Disparities in Environmental Exposures and Health

Unfortunately, some neighborhoods or communities are exposed to more environmental hazards than others and may suffer higher rates of health problems.

These communities often have less economic or political power in society when decisions are made. For example, toxic waste dumps, polluting factories, and busy highways are often built in lower-income neighborhoods or communities of color or ethnic minorities.



Environmental Justice (EJ)

The Environmental Justice Movement emerged in the early 1980s in North Carolina, USA, due to a local dispute over toxic waste dumping near a neighborhood of African-American people.

The movement emphasized that environmental problems cannot be solved without unveiling the disparities and maintaining social justice.



Environmental Justice (EJ)

EJ mandates the equitable treatment and involvement of people of all races, cultures, incomes, and educational levels in the development, implementation, and enforcement of environmental programs, laws, rules, and policies. This is the core definition from the **Environmental Protection Agency (EPA)**

EJ means that everyone has a right to live in an environment that doesn't make them sick, regardless of their race, culture, or income.



Environmental justice process

