

?th lecture:

Environmental Health and Hazards

Done by: Hadeel Al-Madany

Objectives:

1. Concepts of environment and health
2. Environmental hazards
3. Control of environmental hazards
4. Mass gathering and health
5. Principals of occupational health



Health is

"a state of complete **physical, mental and social well-being** and not merely the absence of disease or infirmity"



Public health

is "the science and art of **preventing disease, prolonging life and promoting health** through the **organized efforts** and **informed choices of society, organizations, public and private, communities and individuals.**"

Environmental Health

1.1. Environment: In general, environment refers to the **surroundings** of an object

Pollution: Pollution is the **introduction** of **pollutants** or **contaminants** into a natural environment that **causes instability, disorder, harm or discomfort to the ecosystem** i.e. physical systems or living organisms.



Environment doesn't equal ecosystem.

Pollution can take the form of **chemical** substances or **energy**, such as noise, heat, or light.

Pollutants, the **elements of pollution**, can be **foreign substances or energies, or naturally occurring**:

When **naturally occurring**, they are **considered Pollutants** when they **exceed natural levels**.

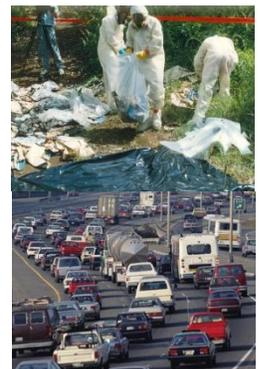
e.g.: adding salt to sea is water is not considered pollution. However, adding the same amount of salt to well's water is.

*pollution is wider than contamination. In other words, contamination is a special case of pollution.



1.3. Environmental health

- Environment is the area surrounding a place.
- **Environmental health** is the branch of **public health** that is **concerned** with all aspects of the **natural and built environment** that **may affect human health**.
- **Environmental health:** Those aspects of the **human health and disease** that are determined by factors **in the environment**
- It also refers to the theory and **practice of assessing** and **controlling factors** in the environment that can potentially affect health.
- All most all communicable diseases have an environmental element.
- An example of an environmental disease is skin cancer caused by UV light.



1.4. Concepts of Environment and health

- Air quality, including both ambient outdoor air and indoor air quality, which also comprises concerns about environmental tobacco smoke.  
- Climate change and its effects on health. 
- Disaster preparedness and response. (e.g. tsunami) 
- Food safety: including in agriculture, transportation, food processing, wholesale and retail distribution and sale 
- Hazardous materials management, including hazardous waste management, contaminated site remediation, the prevention of leaks from underground storage tanks and the prevention of hazardous materials releases to the environment and responses to emergency situations resulting from such releases.
- Housing, including substandard housing reduction
- Childhood lead poisoning prevention.
- Land use planning, including smart growth 
- Liquid waste disposal, including city wastewater treatment plants and on-site waste water disposal systems, such as septic tank systems and chemical toilets. 
- Medical waste management and disposal. 
- Noise pollution control. 
- Occupational health and industrial hygiene.
- Radiological health, including exposure to ionizing radiation from X-rays or radioactive isotopes.
- Recreational water illness prevention, including from swimming pools, spas and ocean and freshwater bathing places. 
- Safe drinking water. 
- Solid waste management, including landfills, recycling facilities, composting and solid waste transfer stations 
- Toxic chemical exposure whether in consumer products, housing, workplaces, air, water or soil. 
- Vector control, including the control of mosquitoes, rodents, flies, cockroaches and other animals that may transmit pathogens.

EXAMPLE I: Air quality Primary pollutants include:

- Nitrogen oxides(NO_x) - especially nitrogen Carbon monoxide - is a colorless, odorless, non-irritating but **very poisonous gas**
- Carbon dioxide(CO₂) - a colorless, odorless, **non-toxic** greenhouse gas associated with ocean acidification, emitted from sources such as combustion, cement production, and respiration
- Particulate matter - Particulates, alternatively referred to as particulate matter (PM) or fine particles, are tiny particles of **solid or liquid** suspended in a gas.
- Toxic metals, such as **lead, cadmium and copper**.
- Chlorofluorocarbons(CFCs) - harmful to the ozone layer emitted from products currently banned from use.
- Ammonia(NH₃)- emitted from agricultural (**farming**) processes.

Notes:

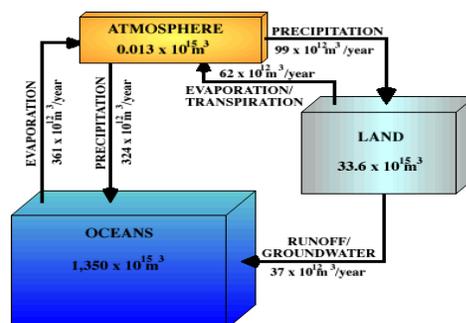
- The direct effect of greenhouse is global warming.
- Ozone layer is formed by ultraviolet rays, yet, it protects the earth from UV light. However, chlorofluorocarbons prevent ozone (O₃) from forming causing ozone hole.
- So the cause of the green house effect is O₂ while the cause of the ozone hole is chlorofluorocarbon.

Secondary pollutants are not emitted directly. Rather, they form in the air when primary pollutants react or interact.

include:

- Particulate matter formed from gaseous primary pollutants and compounds in photochemical smog.
- Ground level ozone (O₃) formed from NO_x and VOCs. Ozone (O₃) is a key constituent of the troposphere.

EXAMPLE II: WATER:

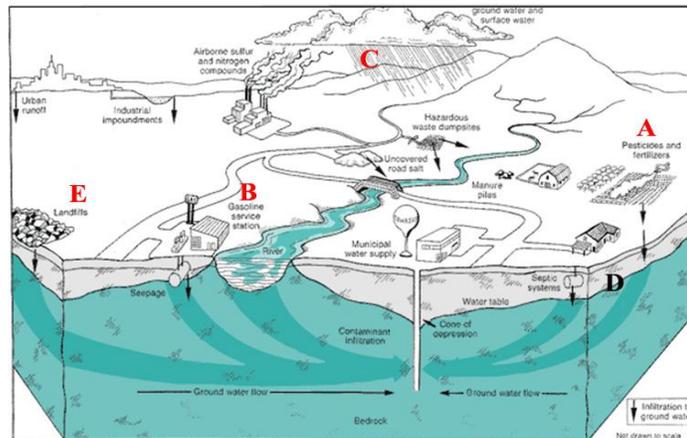
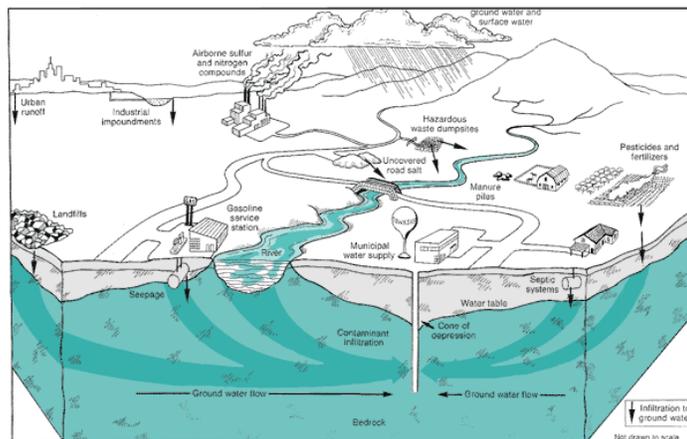


- Evaporation and Transpiration
- Condensation and Precipitation
- Runoff and infiltration

- Streams
- Groundwater – held in aquifers

Sources of Pollution & Causes of Contamination

- Improper Waste Disposal
- Improper Well Construction
- Poor Site Selection
- Wells Not Properly Abandoned
- Improper Waste Storage
- Lack of Information on Hazardous Sites or Activities



Question (34): According to the figure above, surface water and groundwater can be polluted by different sources. Letter “A” on the figure can be considered as one of the following:

- Fertilizer and pesticides pollutant.
- Acid rain.
- Leak of fuel to the groundwater.
- Groundwater contamination with domestic wastewater.
- Groundwater contamination with leakage of solid waste hazardous materials.

Water Disinfection

1. Chlorination using chlorine
2. Ozonization using ozone
3. Bromination using bromine.
4. Iodination using iodine.
5. Exposure to Ultra Violet Rays using UV Rays.
6. Heating. By boiling
7. Addition of lime. using lime.
8. Exposure to Ultra Sonic Waves.

Chlorination is the most common method for ease of control and low cost in addition to its effectively.

Applying Chlorination in rural areas:

This could be carried out with any powder or solution containing Cl₂ as:

- a. Chlorinated lime = Bleaching powder, 25-35% Cl₂
- b. HTH = High test hypochlorite powder, 70-75% Cl₂.
- c. Sodium hypochlorite solution, 15% Cl₂

Ex. Water quantity	= 100 m³/day.
Residual Cl₂ required	= 0.5 ppm
Cl₂ demand	= 0.6 ppm
Cl₂ dose	= 1.1 ppm

So every 1 m³ needs 1.1 gm Cl₂

100 m³ need 100 x 1.1 = 110 gm Cl₂/day

for one month 110 x 30 = 3300 gm Cl₂

Every 1 gm of HTH contains 0.75 gm Cl₂

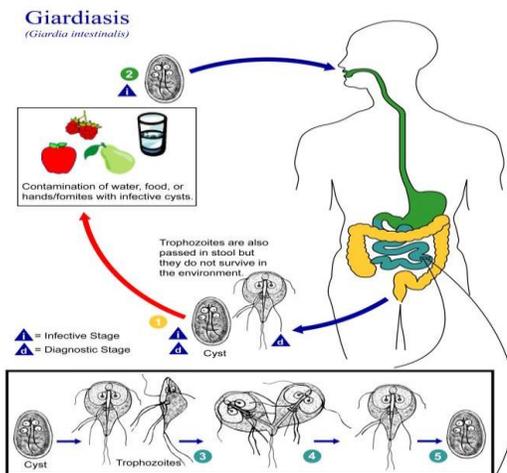
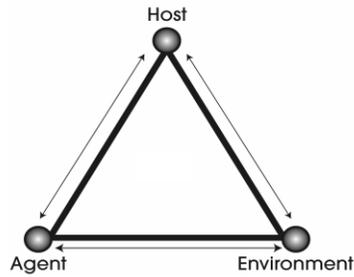
$$100 \times 1.1 \times 30$$

So amount of HTH needed = ----- = 4400 gm HTH / month

$$0.75$$

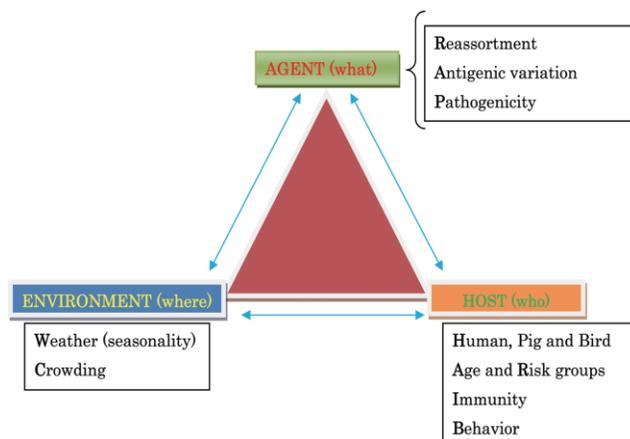
= 4.4 Kg HTH / month

1.5. Epidemiologic Triangle



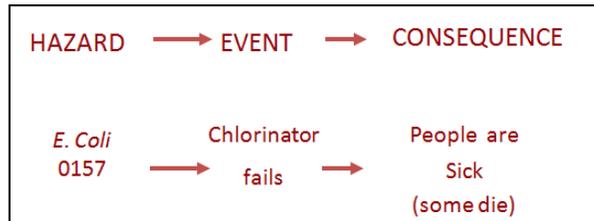
- Pandemic from an Epidemiological Triangle Model

(H1N1) 2009 Virus Viewed



Risk Assessment

Potential for risk



For each event:

- How severe would the public health consequences be? [Severity]
- How likely is the event to happen ? [Frequency]

Importance = Severity X Frequency

Risk scoring matrix

Likelihood	Severity of Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	●●	●●●	●●●●	●●●●●	●●●●●●
Likely	●	●●	●●●	●●●●	●●●●●
Possible	-	●	●●	●●●	●●●●
Unlikely	-	-	●	●●	●●●
Rare	-	-	●	●●	●●●

