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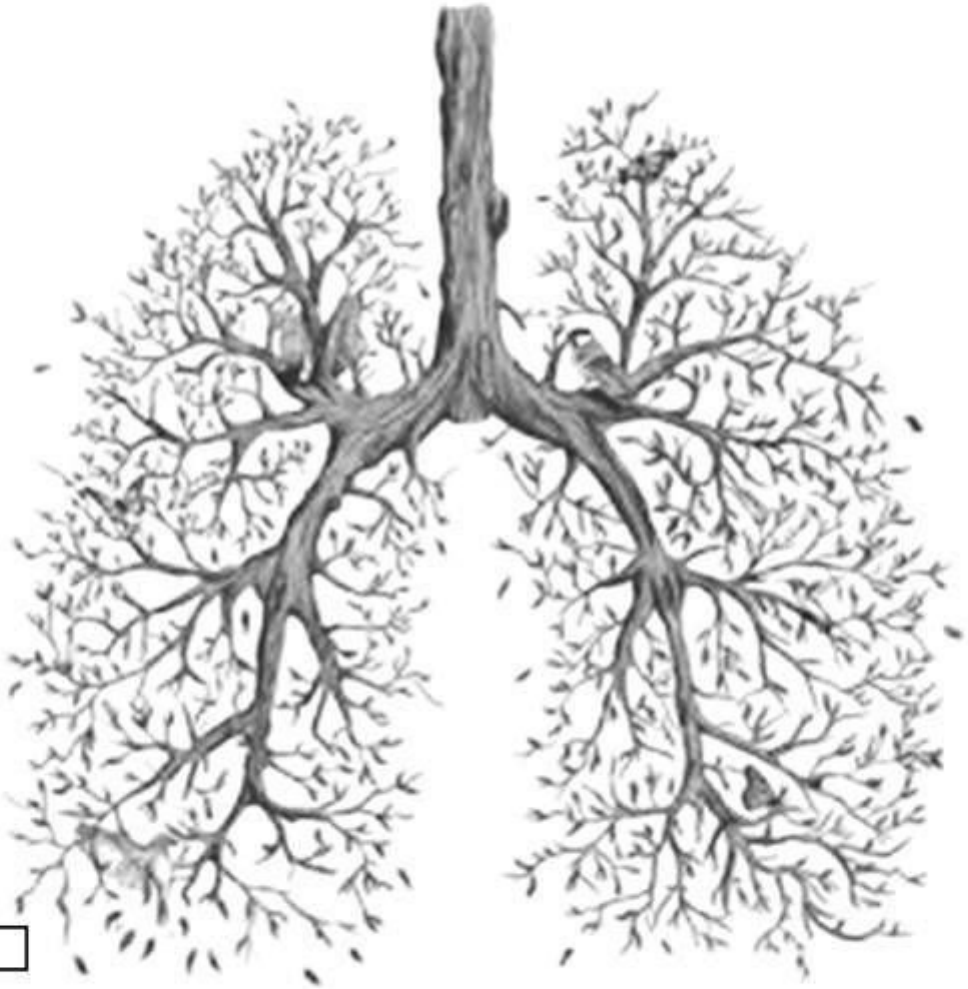
Community Medicine



Slides ☐
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Lecture # **16**

Doctor: **Dr. Madi**

Done By: **Yazan Yanal**

Environmental Health

Introduction:

Today's lecture is the first one with Dr Madi. For the next two weeks he is going to talk about two topics: 1) Environmental Health 2) Occupational Health. Today we will start Environmental Health.

What Does Environment Mean?

It is everything surrounding us that is **affecting** us and **affected by** us.

And from the internet: the conditions that surround someone or something: the conditions and influences that affect the growth, health, progress, etc., of someone or something.

For Example: Chlorofluorocarbons are group of chemicals that have variety of uses; one of them is as a coolant in refrigerators, hospitals, cars, and even at home. Also they are used in fire extinguishers because they block oxygen from reaching the fire as they form heavy bubbles. It is also used for insulation of homes (to prevent heat from going outside as well as to prevent cold from entering inside the house) by injecting it between the 2 layers of the wall. Furthermore it is used in the production of food containers which feel like carton (كرتون) while actually it is made of paper injected with chlorofluorocarbons. **So it is a chemical that is widely used by humans and most of us do not know anything about it,** and this is the dangerous thing; we use chemicals and we don't know anything about them.

Now if we are choosing between 2 different chemicals to be used in your environment (home, office, etc), what are the bases by which you are going to choose

one chemical instead of the other? Cost, ability to use it and obtain it …. **Safety** which is the most important criteria to base your choice on (as a doctor).

But how can we measure the safety level of these two chemicals? How can we know which is hazardous and which is safe to use?

a) Lethal Dose 50 (LD_{50})

Is the measurement or scale that is used for such comparisons. It is the amount of a chemical that kills 50% of the population.

Example: if the LD50 for Arsenic is **0.013g/0Kg** while for Mercury it is **0.041g/kg**, which one is more toxic (numbers are not for memorizing in this example)? Arsenic is more toxic, because **the Smaller the LD50, the more toxic the chemical is (reversible relationship).**

Note: If we have a liquid material we do not use LD50 instead we use **LC50 (lethal concentration 50)**

Units here are standardized **g/kg** (grams (and its derivatives) of the chemical/ Kilograms body weight of the creature that we tested the chemical on)

Are these LD50 figure on their own enough to judge between 2 chemicals? No, it also depends on other factors such as:

b) Routes of Entry:

If you receive an emergency patient whose heart has stopped, will you give him a pill orally? No, you should give him the drug by injection, either IV or directly in the heart.

What is the fastest route of entry?

1) Intravenous (IV) (regardless of its different types)/also in IV we need much less doses in comparing with other routes.
2) Then, Inhalation.
3) Oral.
4) Cutaneous.

An article on the Internet states that alcohol is much more toxic than salt on human health, and to support his hypothesis (claim) he used **LD_{50}** for alcohol **orally** while for Salt **Intraperitoneally** (injection). Now is this a fair comparison?

NO, don't be deceived by these biased figures because the **route of entry** is different, which changes the level of toxicity.

c) Type of Species tested:

Different species (humans, rats, etc) even different subspecies will be affected differently by a specific chemical; therefore LD50 of the same chemical will be different in different species. Sometimes, sex (male or female) affects the figures.

How many LD50 can we have for certain material? A lot, because LD50 for certain material depended on several factors and we mention some of them above (route, species …..).

So back again to where we started, why do you think we use chlorofluorocarbons are so widely used worldwide? Because its **LD50 is high** (safe to use), therefore easily stored, used, and get rid of.

Note: most chemicals we use daily are not tested enough for toxicity and we were surprised many times by chemicals that are found toxic years after being used by humans. This is mainly because tests for toxicity were not available at that time and scientist were not given enough time to test and write a **toxic profile** for these

chemicals before their use in production. Toxic profiles take 5-10 years and millions of dollars to be produced.

Ozone holes:

Scientists discovered that chlorofluorocarbons might react with ozone and they provided equations to support their claim, but these equations were not 100% correct. Years after, photos were taken of the ozone layer, ozone holes in the size of the USA were discovered and those made new scientists test the old equations and correct them to explain this phenomenon and say that reaction between ozone and chlorofluorocarbon is not one to one as the old equations has mentioned.

Now, the ozone layer is part of our environment and **we affect it** by chlorofluorocarbons, in return, **it affects us** by skin cancer.

The Environment is divided into 2 components:

- Living (animals, plants, Humans, and Microorganisms)
- Nonliving (rocks, water, soil, air, etc)

The nonliving is divided to 3 parts:

1) **Physical**: temperature, pressure, altitude, humidity, etc.

These factors affect the types of organisms and microorganisms that live in the environment.

-Temperature: **Ebola** virus is mostly found in Africa because of its hot environment. So if Jordan's temperature increases significantly, the number of Ebola cases will increase, as the physical part of the environment is suitable.

* We have to know about illness and diseases which happen in different area although they are not happening in Jordan, why? because the weather is changing from time to time so that our environment will be more susceptible to have a disease that we don't have it before, another reason our patient may come from another country with a disease that does not happen in our country so we have to know about such diseases in order to have the ability to diagnosis and treat them.

-Altitude: the higher the environment above sea level the less O_2 available in the air. This factor also affects organisms' capability to live in an environment or not.

People living in high mountains will adapt to **low levels of O_2** by increasing the hemoglobin concentration in blood. When these people arrive to the hospital you might think that they have polycythemia (based on their high hemoglobin levels) **but** this diagnosis is wrong, because these levels are **normal** in high attitudes due to the environmental adaptation. Also, people living in Al Ghor (extremely below sea level) will have lower hemoglobin levels than people living in Amman.

Malaria at high levels (mountains) is different than malaria at sea levels, because mosquitoes' types are different. There are 4 different types of malaria due to different temperatures and altitudes.

2) **Chemical:** some places have oil, phosphate, soil full of nutrients, water, etc which affect the type and number of creatures living in these places.

Example: Apples cannot grow in the dessert. This is not only due to high temperature, but also due to low nutrients levels in the soil (sand).

3) Natural (Landscapes)

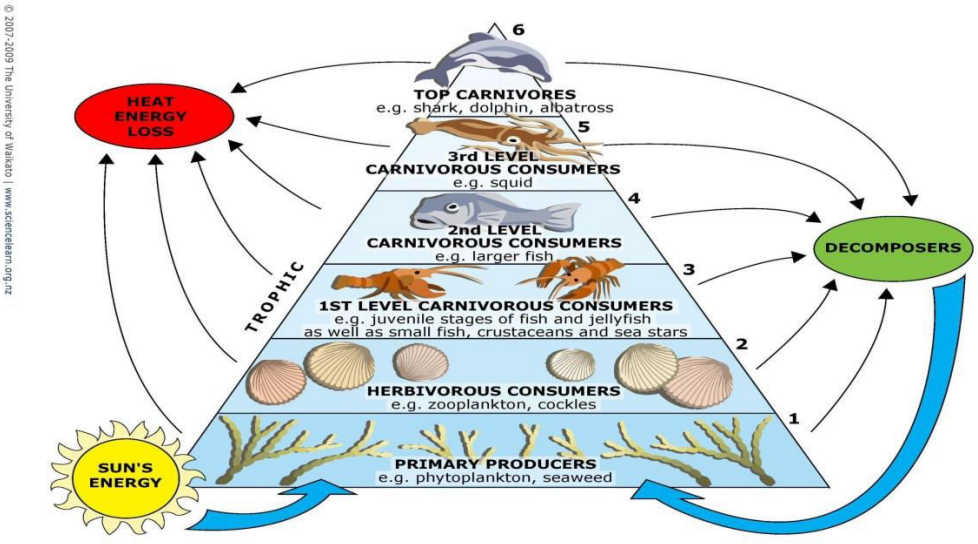
The Environment can also be divided into smaller environmental systems:

Even a country as small as Jordan can have a diversity of systems, as we have 5 environmental systems: 1) al Ghor 2) mountainous 3) marginal 4) sea 5) desert types of organisms living in these systems will have differences.

Note: even a small pool of water can be a system if there was any living components are living in it…

Food Pyramid:

A pyramid has a wide base and a narrow top. The base of the food pyramid is composed of the producers (autotrophes) on top of them come the consumers.



Producers: Plants and microorganisms are capable of converting inorganic (CO_2 and H_2O) matter to organic matter. Examples on microorganisms are Plankton (in sea) and algae.

Consumers: (primary, secondary, tertiary) depend on organic matter derived from plants.

Energy in this pyramid is first taken from the sun by **chlorophyll** then move up the pyramid until it return to the earth by **Decomposers** (micro organisms) feed on dead and remains, also **sweepers** such as ants, phantom (black fish that act as a vacuum), in the desert we have hyena.

Note: any change in any level of this pyramid will affect the rest levels and might cause crisis, this can be seen in Somalia's food crisis.

Note: this pyramid transfer chemicals (including **toxins**) from one level to another which will eventually reach the humans. Toxins such as mercury that are spelled in the ocean in Brazil will eventually reach Jordan by contaminated fish.

"Winter is coming."