كلية الطب والجراحة

جـــامعة ٦ اكـــتوبر
October 6 University Egypt

Lecture (1)

Environmental Health

(Air Pollution)

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In this lecture we will discuss the following:

1- What is the environment? What are the components of the environment?

2- What is health?

3- What is environmental health?

4- Natural & built environment.

5- Benefits of environmental health.

6- Aims of environmental health.

7- What is Pollution? Sources of outdoor air pollution.

8- 1ry. & 2ry. Air pollutants.

9- The most important 6 air pollutants according to EPA.

What is the Environment?

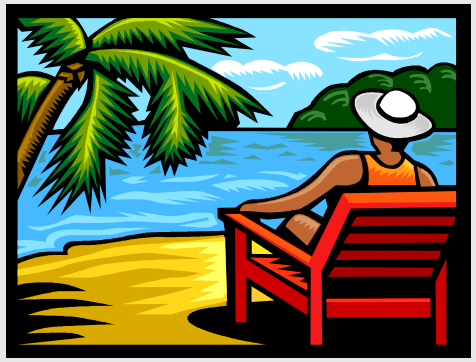
The environment ***is " All external conditions and circumstances surrounding and affecting the growth and development of an organism or community of organisms".***

The trees, air, & soil around us

ALL the places we live, work & play

Our fields, farms

Our oceans, lakes, and rivers



Components of the Environment:

PHYSICAL:

Air, water, soil, housing, climate, heat, light, noise, radiation, etc.

BIOLOGICAL:

Viruses, microbial agents, insects, rodents, animals, etc.

PSYCHOSOCIAL:

cultural values, customs, beliefs, habits, attitudes, morals, religion, education, lifestyles, community life.

What is health?

According to WHO

"Health is a state of complete physical, mental and social well-being and not only the absence of disease"

Definition of Environmental Health:

The WHO defined it as *"The branch of public health concern with all aspects of the natural and built environment that may affect human health"*.

This definition focuses on the external factors to a person (like food, air, water, soil and built environment) and exclude behavior related to social and cultural environment as well as internal environment e.g. genetics

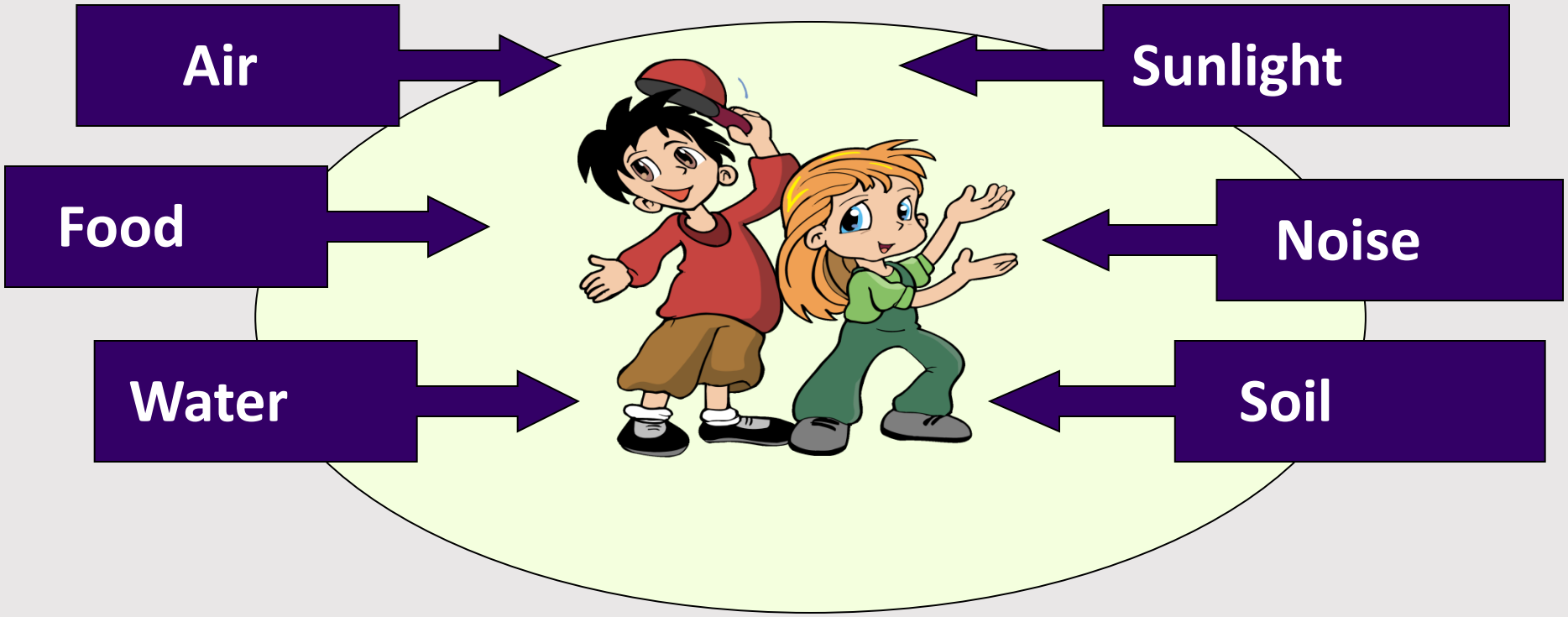
* Natural Environment :

Means all living and non-living things that are **naturally** on Earth (the environment that is not influenced by people).

* Built Environment :

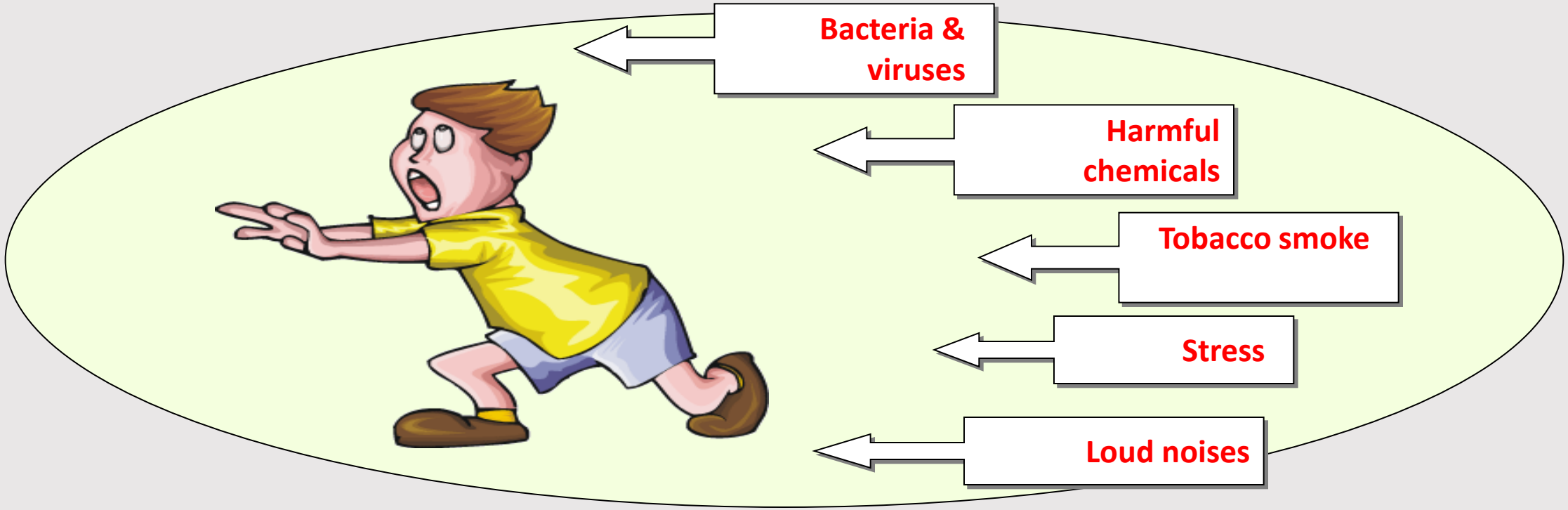
The part of the physical environment that is concerned human activities. It consists of roads and buildings. It include **indoor environment** and places in which we live, work, play and educate.

Environmental Health?



The study of how the environment affects your health.

Hazards



A hazard is *anything in the environment that can hurt you or make you sick*.

Background

The environment influences our health through exposure to physical, chemical and biological risk factors and through our behavior in response to those factors.
WHO reported that *"Environmental risk factors play a role in more than 80% of the diseases".*

Aims of Environmental Health:

1- It covers the **assessment and control** of those environmental risk factors that can affect health.

2- It aims at **preventing disease and early detection** of health hazards due to exposure to different environmental risk factors.

Role of public health physician regarding environmental health issues:

This role is part of his/her role as PHC physician and include:

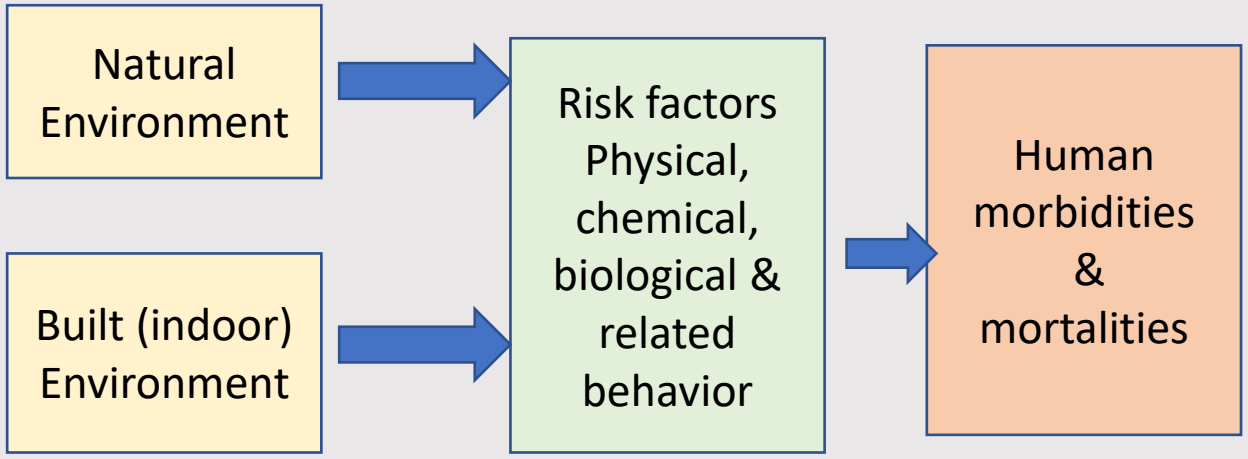
1) Recognition of environmental problems in the area he/she serves,

2) Identifying the agencies responsible for implementing prevention and control of the environment al hazards,

3) Undertaking corrective measures if possible,

4) Continuous monitoring,

5) Health education to the public.



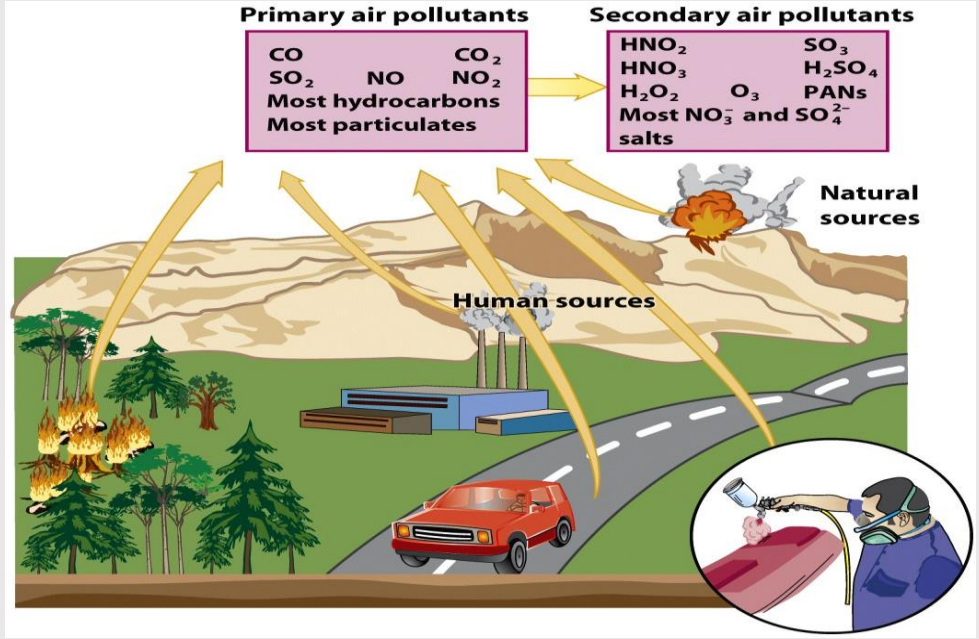
"The way the environment affects human health"

Environmental pollution

- **Environmental pollution**: The introduction of contaminants into the natural environment that causes adverse effects to living and non-living components.
- Pollutants can be either:

1. Man-made
2. **naturally** occurring contaminants

"Volcanic discharge"



- A pollutant is a substance or energy introduced into the environment that has undesired effects, or adversely affects the human being.
- It may cause *long*- or *short-term* damage.

Forms of Pollution

I. Air

II. Water

III. Land and soil

IV. Marine and coastal

V. Chemical

VI. Waste

I. Air Pollution

- The main 5 components of air are:
  - Nitrogen 78 %
  - Oxygen 21%
  - Argon 0.93%
  - Carbon dioxide 0.04%
  - Trace amounts of helium, neon, methane, hydrogen and water vapour.

- Air pollution, which kills ***more than 7 million*** people every year, is the biggest environmental health risk of our time.
- Airborne pollutants are responsible for:

* About ***one third*** of deaths: from stroke, chronic respiratory disease, and lung cancer, and ***one quarter*** of deaths from heart attack.

Air pollution can be defined as :

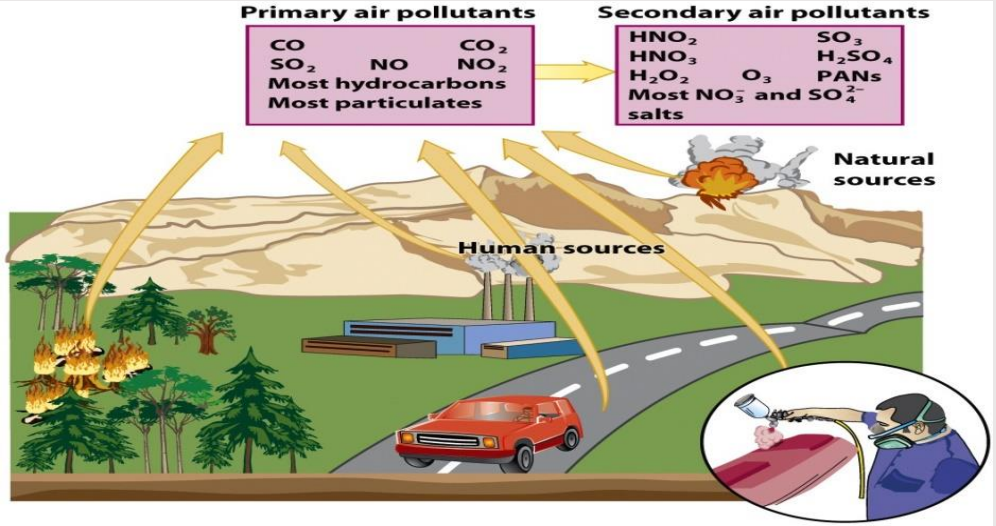
"The presence of one or more pollutants in the air, changing its physical or chemical properties causing risk to human, animal or plant life".

Air pollutants

1. Primary air pollutants:

- Pollutants that are formed and emitted directly from particular sources.

e.g. CO, CO_2 , NO2 and SO_2



2.Secondary air pollutants:

- Harmful substance formed in the atmosphere when a primary air pollutant reacts with substances normally found in the atmosphere (as sun light) or with other air pollutants

e.g. ozone and sulfuric acid.

Sources of Outdoor Air Pollution

Sources of 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.

a. Outdoor air pollution

b. Indoor air pollution

Sources of outdoor air pollution:

***i. Natural sources, including*:** Volcanic eruptions and wind dust.

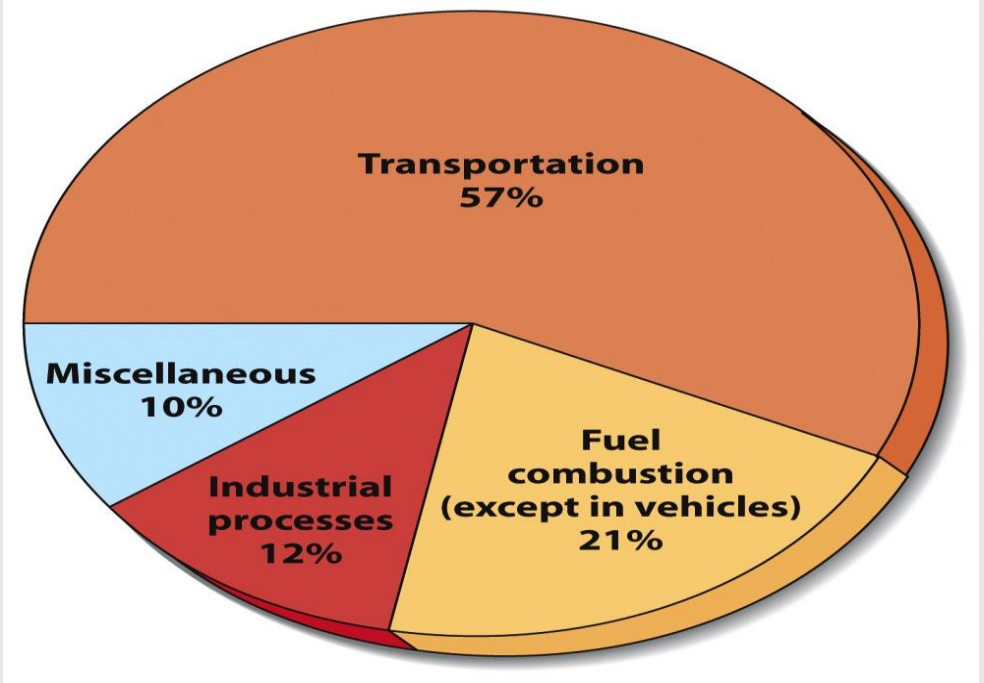
ii. Man made sources, including

1. Burning of fossil fuels in electricity generation.
2. Different industrial processes and solvent use.
3. Agriculture (fertilizers and pesticides). 4- Transportation.

Sources of Outdoor Air Pollution

- Two main sources
  - Transportation
  - Fuel combustion

- Industrial processes and Intentional forest fires are also high.



1. Transportation:

- Exhaust of automobile and other means of modern transportation is major source of pollutants, exhaust contain:

- 77% carbon monoxide,
- 7.5% nitrogen oxides,
- 13.5% hydrocarbons
- lead compounds (when using tetraethyl lead)

2. Combustion of fossil fuel:

- Sources:

  Power stations for electricity generation, industry and households activities.

- Effects:

Release of large amounts of CO_2 gas, harmful particles and oxides of sulfur and nitrogen.

3. Industrial and manufacture process

- Give off:

- Dust - Fumes -Vapors - Gases

4. Agricultural activities: Are sources of:

- Pesticides
- Fertilizers

5. Miscellaneous

- Windblown dust.
- Fires.
- Active volcanoes (sulfur oxides and hydrogen chloride)
- Decomposition of organic matter from human, plants, animal waste, leading to release of:

Hydrogen sulfide – methane- ammonia- carbon dioxide) + bacteria , fungi, other organisms.

The end

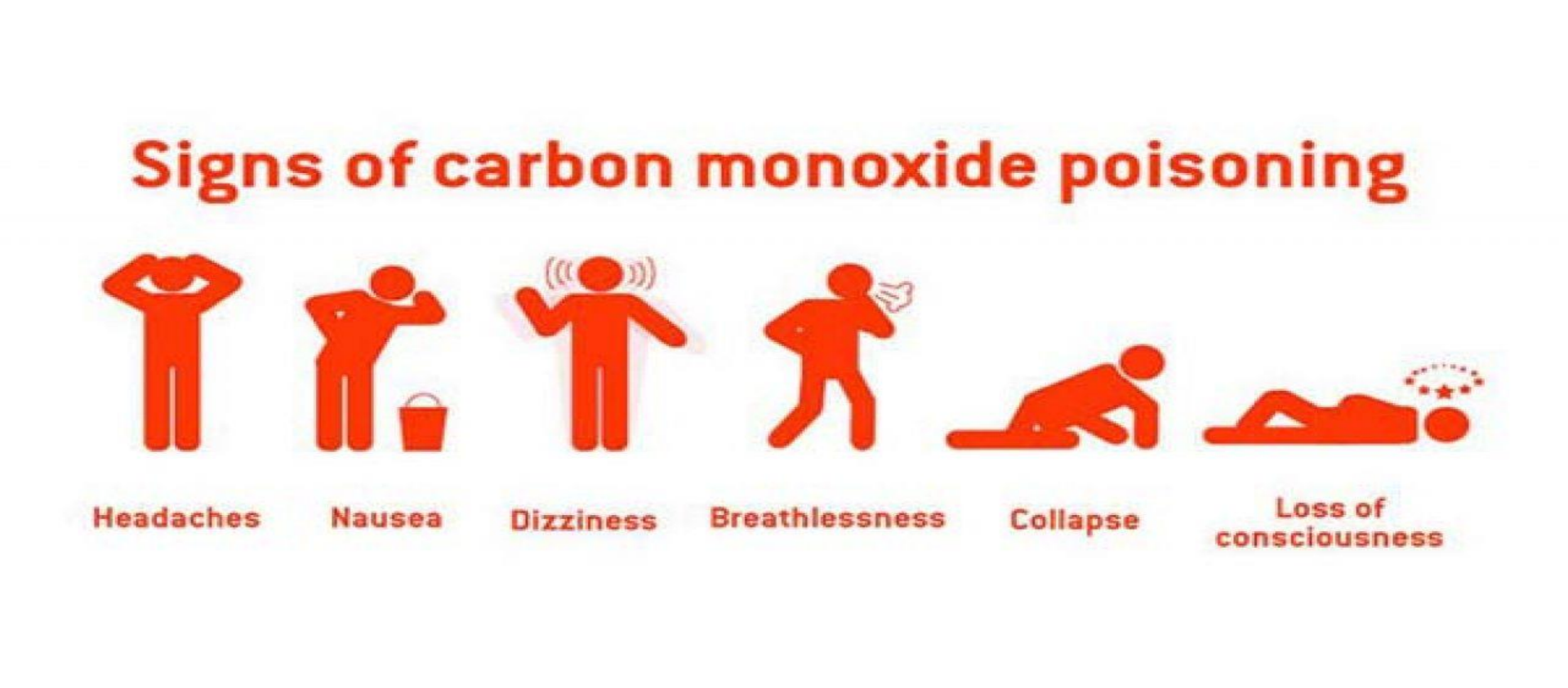
Criteria of outdoor air pollution

- EPA (Environmental Protection Agency) described group of outdoor air pollutants according to health and environmental effects.
- The major 6 outdoor air pollutants are:

1. Carbon Monoxide (CO)

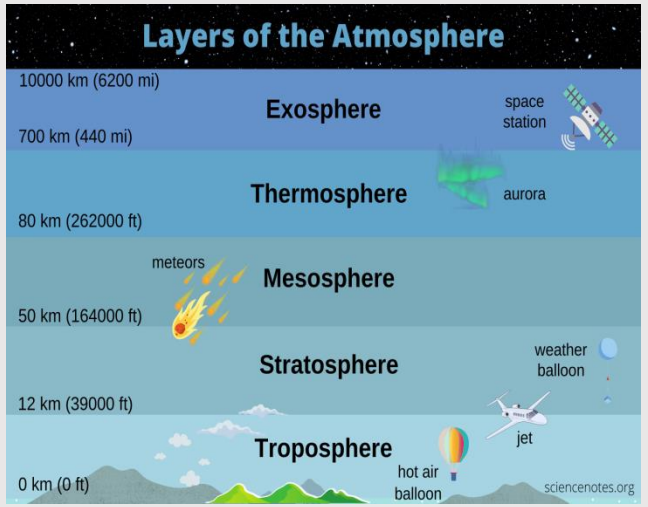
- The greatest sources of CO to outdoor air are **cars, trucks** and other vehicles or machinery that burn fossil fuels.
- A variety of items in your home such as gas space heaters, and furnaces, and gas stoves also release CO and can affect indoor air quality.
- Smoking increase exposure to CO by 4%
- Butane غاز البوتاجاز ⟶ incomplete combustion ⟶ CO
- CO It is called the **silent killer** because it is colorless, odorless, tasteless , non-irritating gas. It is released due to incomplete combustion.

HB has affinity to combine with CO 210 times more than Oxygen (carboxy-HB).
According to the blood level of (carboxy-HB) signs & symptoms include the following:



2. Ground Level Ozone

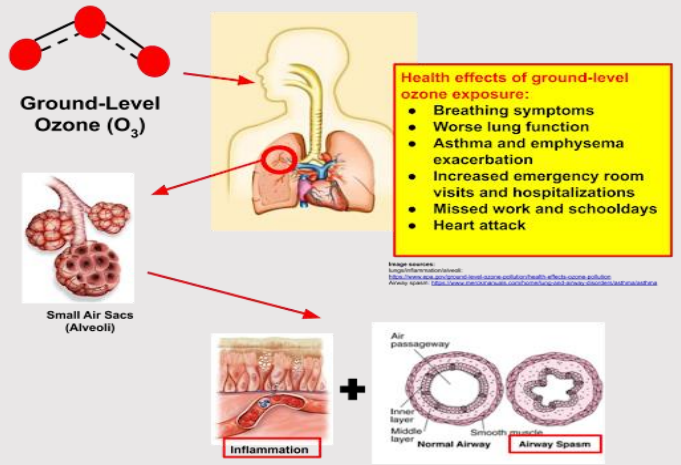
- Ground-level ozone is **a colorless and highly irritating gas that forms just above the earth's surface**. It made up of three oxygen atoms (O_3).
- The **stratospheric ozone**, (good ozone) occurs naturally in the stratosphere, where it forms a protective layer that shields us from the sun's harmful ultraviolet rays. This beneficial ozone has been partially destroyed by manmade chemicals, causing what is sometimes called a **"hole in the ozone."**
- **Tropospheric, or ground level ozone**, is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, chemical plants, react together in the presence of sunlight.



Ozone at ground level is a harmful air pollutant, because of its effects on people health in the form of:

1- Immediate exposure problems include:

- shortness of breath, wheezing and coughing;
- asthma attacks;
- increased risk of respiratory infections;
- increased susceptibility to pulmonary inflammation; and



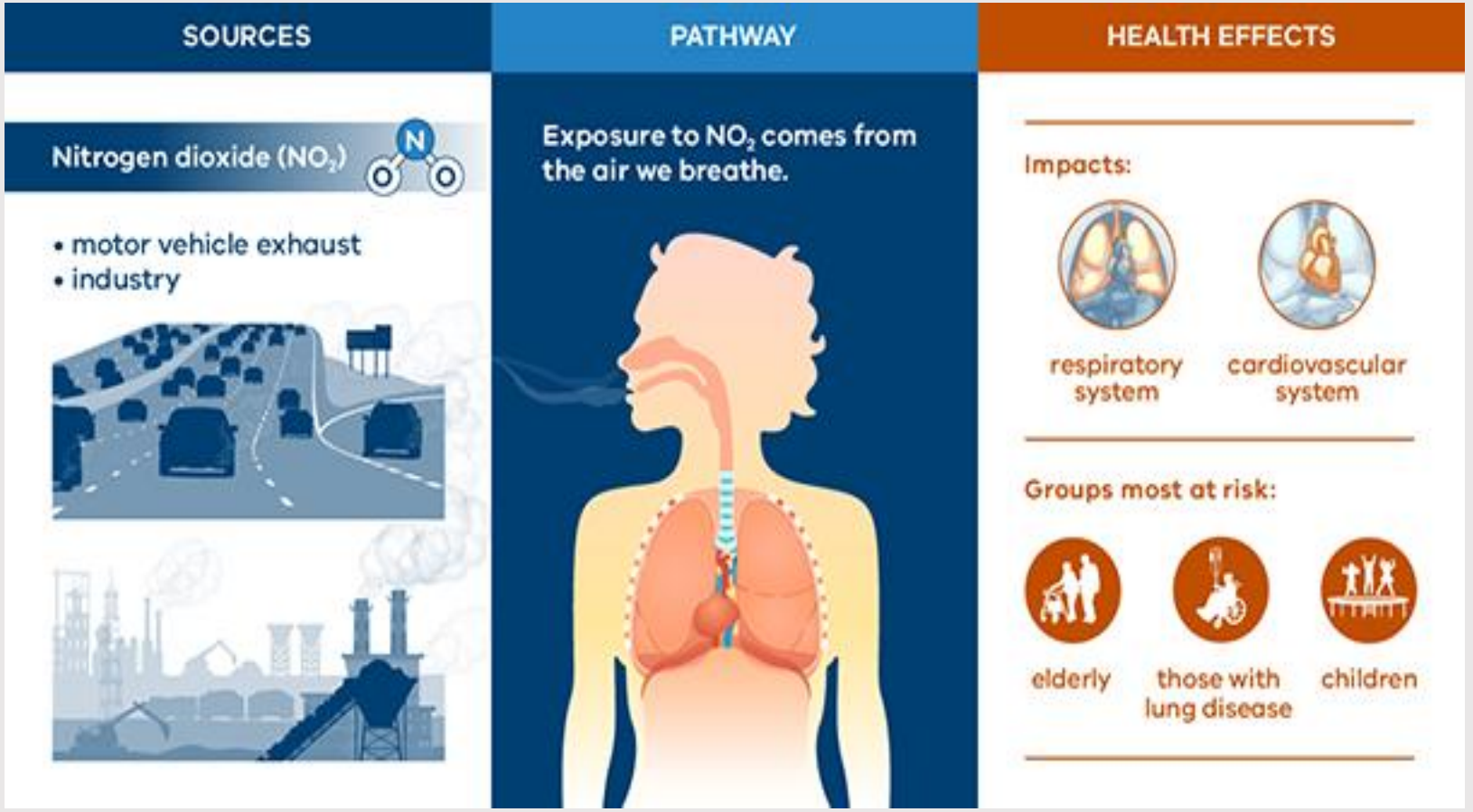
2- Long-term exposure risks include:

- increased respiratory illnesses,
- nervous system issues,
- reproductive issues (including reduced male and female fertility and poor birth outcomes),
- cancer and also increased cardiovascular mortality.

3. Nitrogen Dioxide

- Nitrogen dioxide, or NO_2 is a gaseous air pollutant composed of nitrogen and oxygen and is one of a group of related gases called nitrogen oxides, or NOx.
- NO_2 primarily gets in the air from the burning of fuel.
- NO_2 forms from emissions from cars, trucks and power plants.

Nitrogen dioxide causes a range of harmful effects on the lungs, including: Increased inflammation of the airways; Worsened cough and wheezing; Reduced lung function; Increased asthma attacks.

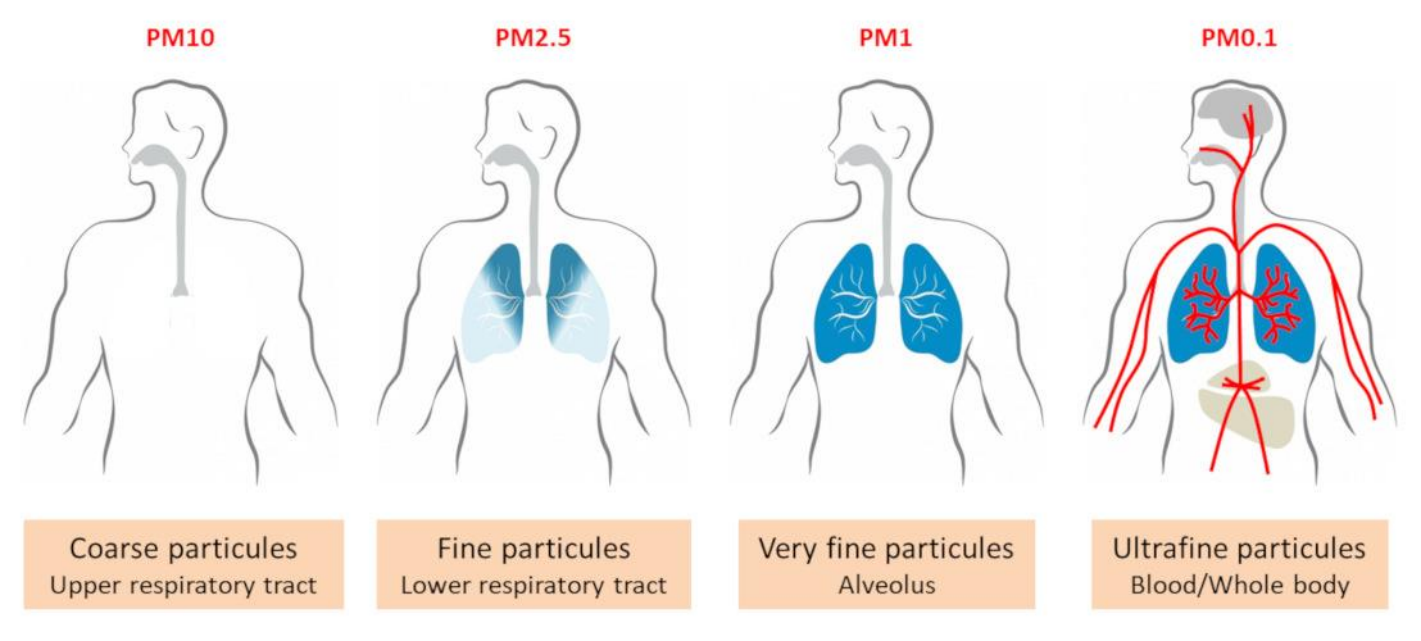


4. Sulphur Dioxide (SO_2)

- Sulfur dioxide is also a **natural byproduct of volcanic activity**.
- Like nitrogen dioxide, sulfur dioxide can create secondary pollutants once released into the air.
- Sulfur dioxide affects the respiratory system, particularly lung function, and can irritate the eyes.
- Sulfur dioxide **irritates the respiratory tract** and increases the risk of respiratory tract infections.
- It causes coughing, mucus secretion and aggravates conditions such as asthma and chronic bronchitis.

5. Particulate Matter

- PM (particulate matter): the term for a mixture of solid particles and liquid droplets found in the air.



WHAT ARE THE HEALTH RISKS OF PARTICULATE MATTER?

Particulate matter poses a serious health risk because it can travel into the respiratory tract. PM2.5 is especially dangerous because it can penetrate deep into the lungs and sometimes even into the bloodstream.

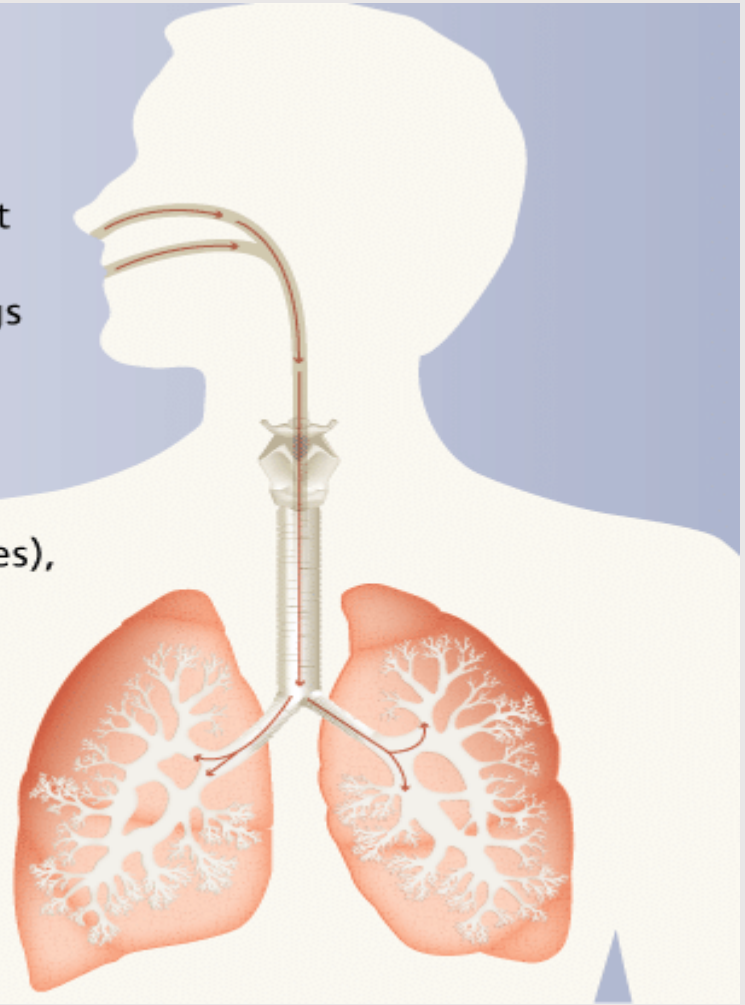
HEALTH EFFECTS

- Decreased lung function
- Chronic bronchitis
- Increased respiratory symptoms
- Cardiac arrhythmias (heartbeat irregularities),
- Heart attacks
- Premature death

GROUPS SENSITIVE TO PM2.5

- People with heart or lung disease
- Older adults
- Children
- Pregnant women

Source: www.epa.gov



6. Lead

Sources of environmental lead

Health effects of lead poisoning:

Lead poisoning symptoms in children

Signs and symptoms of lead poisoning in children include:

- Developmental delay - Learning difficulties - Irritability - Loss of appetite -Weight loss
- Abdominal pain, Vomiting , Constipation

Lead poisoning symptoms in adults

Signs and symptoms in adults might include:

- High blood pressure - Joint and muscle pain - Difficulties with memory or concentration - Headache
- Abdominal pain - Mood disorders
- Reduced sperm count and abnormal sperm
- Miscarriage, stillbirth or premature birth in pregnant women


HOW TO
TO REDUCE
AIR POLLUTION

Essential Control Measures To Improve Urban Air Quality

Preventions

- Planting trees.
- Reducing vehicle exhausts.
- Using less pollution fuels.
- Using mass transport.

- Industrial area should be cited far away from residential area.
- Use of tall chimneys reduces- concentration of air pollutants at ground level.

Thank You