

# Water Pollution

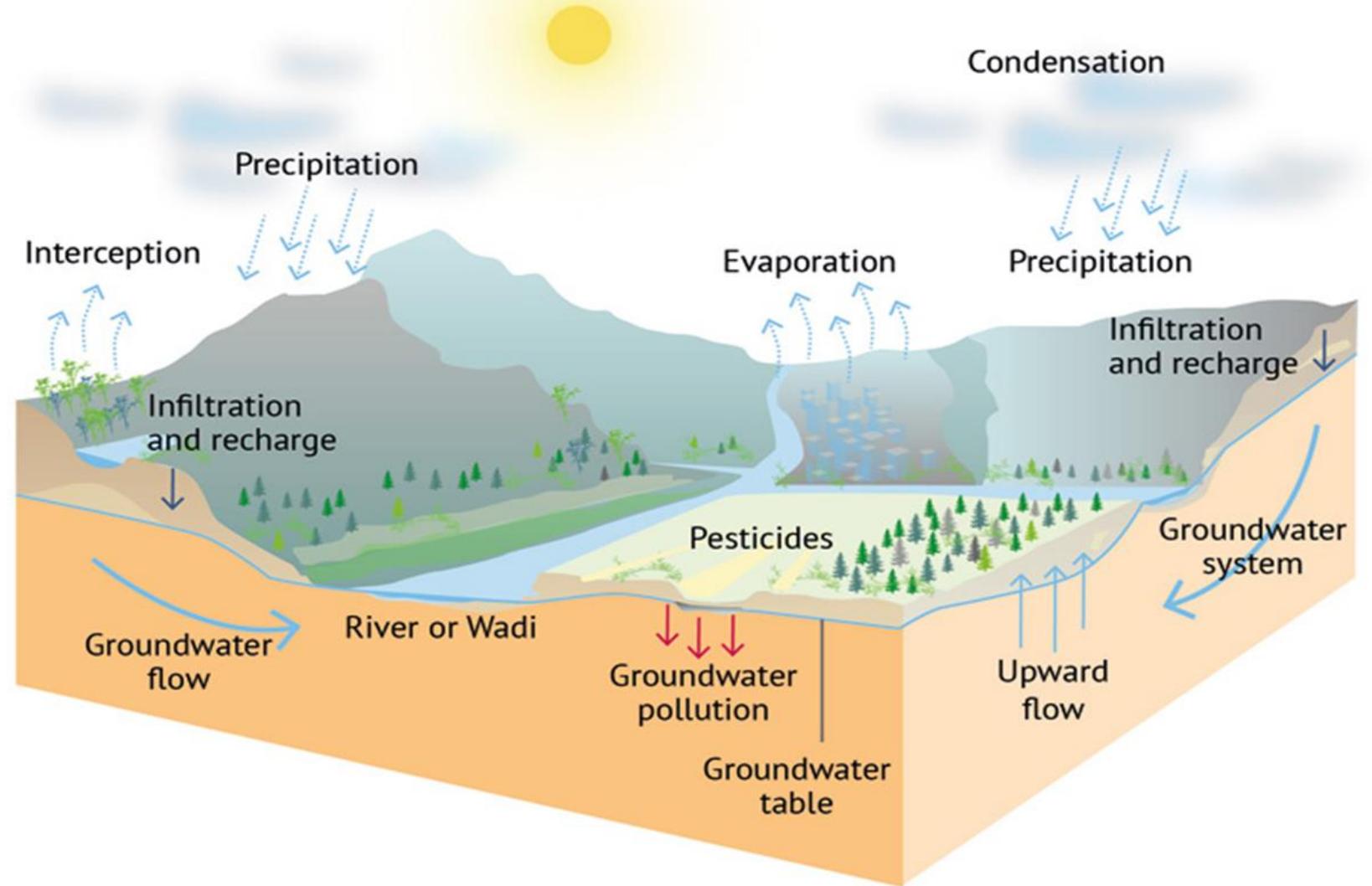


# Water Situation

Today JORDAN is the single poorest country in the world in drinking water !! And this majorly due to the exponential increasing in the population with the same constant amount of available water .

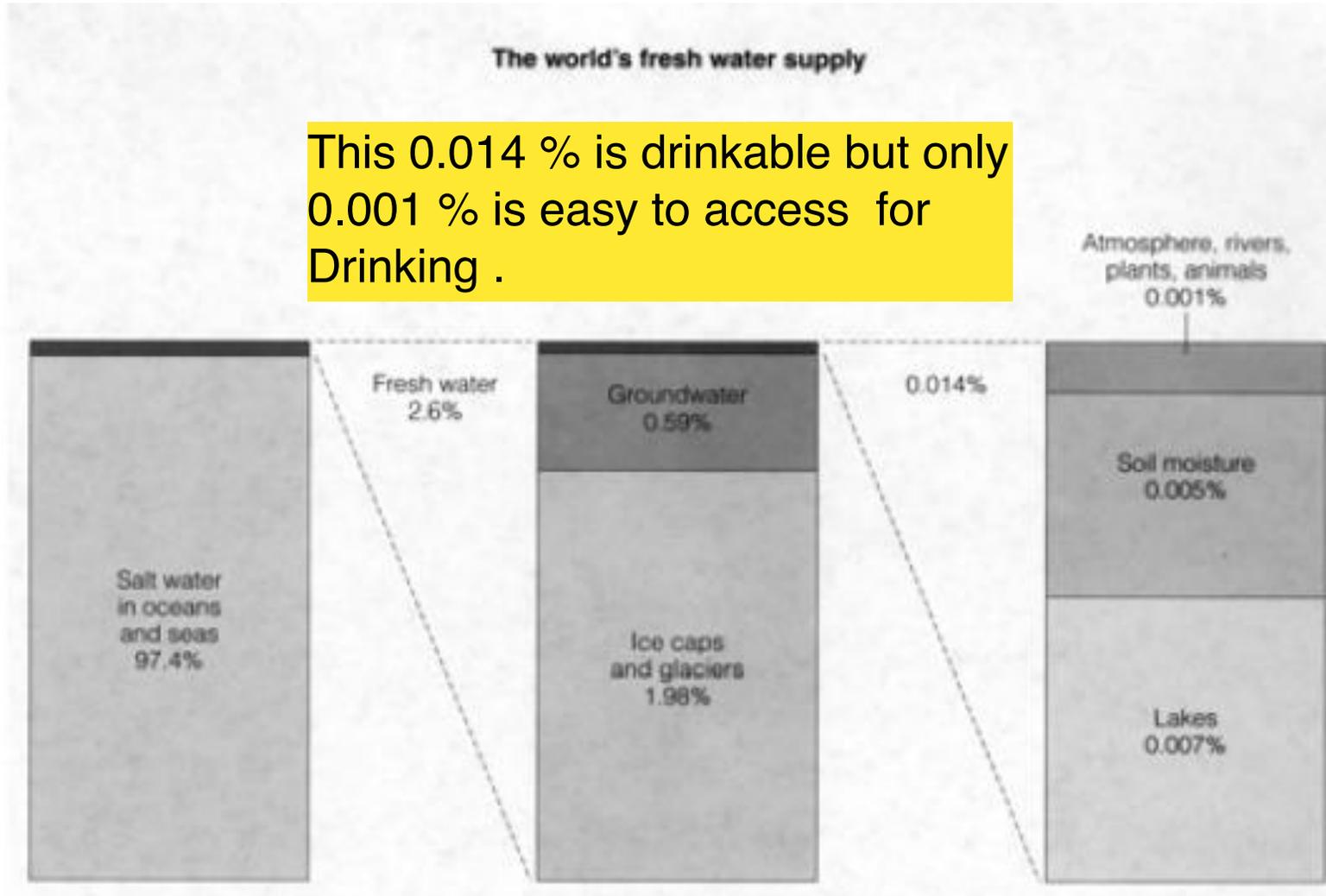
- \* **85% of the world population lives in the driest half of the planet (United Nations, 2013)**
- \* **1 billion people do not have access to clean water and almost 2.5 billion do not have access to adequate sanitation.**
- \* **2 million people die each year due to unsafe water, sanitation and hygiene (WHO, 2015).**

# The Hydrologic cycle (the water cycle)



# World Freshwater Supply

This 0.014 % is drinkable but only 0.001 % is easy to access for Drinking .



Salt water  
Isn't drinkable

# Water Pollution

According to WHO, water pollution occurs when:

“foreign materials either from natural or other sources are contaminated with water supplies and may be harmful to life, because of their toxicity, reduction of normal oxygen level of water, **aesthetically unsuitable effects** and spread of epidemic diseases”.

\* aesthetically unsuitable effect :- this means that it distorts the water's appearance ( water's color, etc ) , one example on this is when the temperature of oceans and seas increases due to global warming coral reefs that used to be colorful will loose their color and become grey in color .

# Main Sources of Water Pollution

Examples of major water pollutants that affect the health of humans are:

- 1 • **Infectious agents:** (bacteria, viruses, and parasites) that contaminate the water through sewage, human waste, and animal excreta
- 2 • **Radioactive waste:** contains highly toxic materials such as uranium, thorium, and radon (mining activities, power plants or natural sources)
- 3 • **Chemical substances:** that contaminate the water (**organic:** pesticides, plastic, oil, detergents, etc. - coming from domestic, industrial or agricultural waste, or **inorganic:** acids, metals, salts - domestic and industrial effluents).

# How Does Water Pollution Affect Us?

- 1 • **Drinking** polluted water
- 2 • **Bathing or showering** in polluted water
- 3 • **Swimming** in polluted water
- 4 • **Breathing the vapors** of a polluted water while sitting next to a polluted water source
- 5 • **Consuming polluted food** from animals fed with polluted water or food affected by polluted water OR vegetables irrigated with polluted water or grown in an area with polluted groundwater

# Two Types of Sources of Water Pollution

Although water pollution occurs from a variety of sources, there are two terms used to describe how the water becomes polluted:

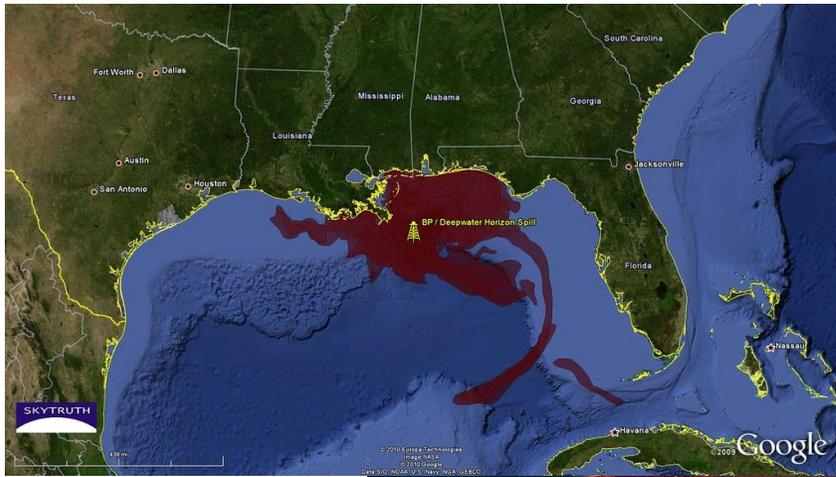
1. Point sources
2. Non-point sources



# Point Source Pollution

- 1. comes from a specific source, like a pipe. Pollution will be located at a specific place.**
- 2. Sources are: factories, industry, municipal treatment plants.**
- 3. Easy to identify, monitor and regulate.**

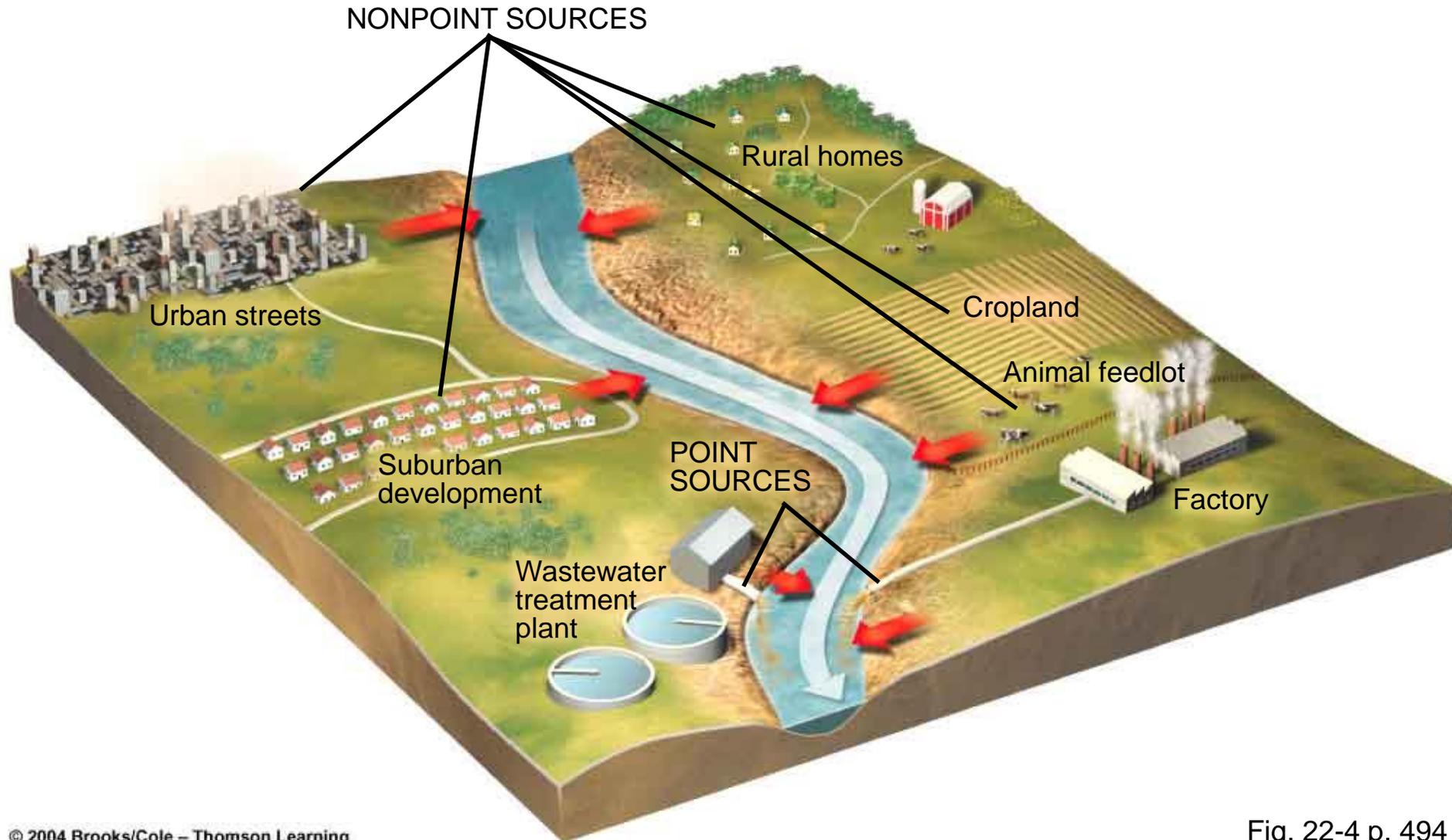
**The BP oil spill in 2010 is an example of point source pollution, because the massive amount of oil leaked from a single point of origin.**



This example only for further visualizing the concept !  
This happened back in in the Gulf of Mexico off the coast of Louisiana , one of the crude oil pipelines that transports crude oil to the states of south america has leaked some of it , and due to its low density it floats on the ocean's surface making a thick layer .  
This affects the most the wildlife , a lot of living beings have died .



# Point and Nonpoint Sources



# What is non-point source pollution?

- ✓ **Nonpoint Source (NPS) Pollution is pollution associated with storm water or runoff.**
- ✓ **Difficult to identify and control**
- ✓ **Broad and Diffuse area is affected**
- ✓ **Expensive to clean up.**

**For example, one water body (river or sea) may be contaminated by multiple sources like agricultural runoff, city street runoff, construction sites and residential lawns (e.g. The Mississippi River).**

# Non-point Sources

- 1 • **Agriculture activities: a leading cause of water pollution:**
  - Fertilizers and pesticides
  - Bacteria from livestock and food processing wastes
- 2 • **Industrial facilities**
- 3 • **Medical facilities**
- 4 • **Mining**
- 5 • **Transportation, roads and parking lots**
- 6 • **Human-made materials (E.g., plastics)**

# Point Source of Polluted Water in



This is a pipe from one of the factories throwing up their wastes in one of the rivers .

# Nonpoint Sediment from Unprotected Farmland Flows into Streams



# Linking Land Use to Water Quality



**More Imperviousness = More Polluted Water**

# Highly Polluted River in China



# Trash Truck Disposing of Garbage into a River in Peru



# Controlling Water Pollution:

There should be vigorous efforts to control water pollution with the involvement of individuals, communities, governments and social activist groups.

- ✓ Mass social awareness should be inculcated regarding the nature and effects of water pollution, and remedial measures.
- ✓ Strict laws should be enforced, and persons violating the provision of pollution control should be penalized.

# Food Contamination

# Food Contamination

- ✓ A toddler is hospitalized as a result of drinking contaminated apple juice.
  - ✓ A preschooler dies because he eats a hamburger that is not thoroughly cooked.
  - ✓ A cruise ship comes back to port early because many passengers have become ill with the same symptoms.
  - ✓ A school cafeteria is unable to operate because half the staff is out with symptoms of vomiting, diarrhea, and fever.
- 
- **In each case, the illness or death was traced to something in the food supply.....this implies food contamination**

# What is Contamination?

- ***Contamination*** is the ***state of being impure or unfit for use due to the introduction of unwholesome or undesirable elements.***



# Contamination of food

Un normal substances are added on purpose to the food for many reasons such as :- prolonging the expiration of this food , making it colorful , have a more salty taste or less salty taste , or making it more sweet...etc

- **People's lives depend on a reliable and safe food supply that is free from harmful substances.**

**1**  **Contamination occurs when something not normally found in the food is added.**

**2**  **Contamination implies the addition is not intended or planned. The substance added may or may not cause health problems.**

# Contamination of food

The three main ways in which food can be contaminated are:

- 1) Microbial contamination (includes bacteria, moulds and viruses)
- 2) Physical contamination
- 3) Chemical contamination

# Microbial contamination:

- 1 **Mold** often occurs if food is stored at the wrong temperature, at high humidity or beyond its recommended shelf-life.
- 2 **Viruses** may be brought into food on raw foods such as shellfish which have been bought from an unapproved source.
- 3 **Bacterial** contamination is the most significant in terms of microbial food poisoning and foodborne illnesses.

# Bacterial Contamination of food

**Bacterial cross-contamination** may be defined as: “the transfer of harmful / pathogenic bacteria from one item / food / surface / person to food.”

**Direct cross-contamination:** occurs in food when there is direct contact between the source of the bacteria and food.

**Examples include:**

- Raw meat stored above or in contact with cooked meat
- Raw chicken stored above or in contact with coleslaw
- Food handler sneezing/coughing onto food

# Bacterial Contamination of food

**Indirect cross-contamination:** This occurs when harmful bacteria are transferred from the source to the food via a vehicle.

## **Examples include:**

- Using the same knife/chopping board to slice raw meat and then cooked meat without washing it and disinfecting it between tasks
- Using the same cloth to wash down the raw food preparation area and then the cooked food preparation area
- Touching food after blowing your nose, without first washing your hands

# foodborne Infections (invasive Infections)

- Microbes release digestive enzymes that begin to damage body tissue and cause illness. This type of foodborne illness is called ***foodborne infection***.
- ❑ This infection cannot occur if the microbes are killed.
- ❑ Foodborne infections may be caused by bacteria and viruses. A large number of living organisms is usually required to cause illness.
- ❑ Symptoms caused by damage when organisms feed on their host (Fever, diarrhea, vomiting, abdominal pain).

# Invasive Infection Bacteria:

- ✓ SALMONELLA
- ✓ AEROMONAS
- ✓ CAMPYLOBACTER
- ✓ SHIGELLA
- ✓ VIBRIO PARAHAEMOLYTICUS
- ✓ YERSINIA
- ✓ ENTERIC-TYPE ESCHERICHIA COLI (e-coli)

The most common type of bacteria that infects us through food contamination is : SALMONELLA .

# Viral Food Infections:

Three main types of viruses have been found to cause foodborne illness. These include:

- 1 • **Rotavirus**
- 2 • **Norwalk virus**
- 3 • **Hepatitis A virus.**
  - **Infections have been traced to infected food handlers.**

The most common type of viruses that infects us through food contamination is Rotavirus specially in summer ( because in high temperatures food spoils and we still eat it ).

Also , hepatitis A is caused by hepatitis A virus that is transmitted by the feces of a person infected with this virus . HOW ? By not washing the hands :)

# Chemical Contamination of Food

Undesirable chemicals can enter foodstuffs during:

- 1 • Growth – e.g. veterinary drugs (antibiotics and hormones), fertilizers, pesticides and environmental contaminants e.g. lead**
- 2 • Processing – e.g. oils and lubricants from machines, cleaning chemicals**
- 3 • Transport – e.g. as a result of spillage or leaks**
- 4 • Sale – e.g. cleaning chemicals**

# Chemical Hazards

## 1 ACUTE

SMALLER MORE ISOLATED OUTBREAKS  
USUALLY ACCIDENTAL/MIS-USE

## 2 CHRONIC/LONG TERM

MAJORITY  
EXCEPT TOXINS (USUALLY ACUTE)  
LONG TERM EXPOSURE  
CARCINOGENS/OTHER TOXIC EFFECTS

## 3 RISK ASSESSMENT

LESS STRAIGHT FORWARD (compared to biological hazards)

Like mercury ; mercury can't get out of the body so when we eat food contaminated with mercury it will accumulate in our body .

# Classes of Chemical Residues

1. Food Additives (E.G. Vitamins, Colors, Flavors)
2. Pesticide Residues
3. Veterinary Medicines (E.G. Hormones And Antibiotics)
4. Environmental Residues (Lead: Leaded Gasoline, Solder For Tin Canned Food)
5. Cleaning Agents
6. Allergens

Lead in leaded gasoline moves from car exhaust to the atmosphere which will be transmitted to plants and finally it will exist in the fruits and vegetables that we eat , which will harm our bodies .

# Physical Contamination

- ❑ Food can be contaminated physically by foreign objects.
- ❑ Foreign objects can be brought into the premises with raw materials or introduced during storage, preparation, service or display.
- ❑ Foreign objects which are commonly associated with food complaints include:
  - Nuts, bolts, wire, metal
  - Cardboard, plastic, string
  - Rodent droppings, hairs
  - Cigarette butts, glass, flaking paint
  - Earrings, fingernails