

EFFECT OF ENVIRONMENT ON HEALTH



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

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Environment

- ▶ Internal Environment: includes tissues and organs of a body
- ▶ External environment:
 - Physical: Water, air, food and soil etc.
 - Chemical: Insecticides, pesticides, fertilizers
 - Biological: Plants, rodents, animals, insects and micro-organisms.
 - Social: Society, culture, customs, occupation, religion etc.

WATER

- ▶ Water is essential for life next to air.
- ▶ Average daily water need per individual is 150-200 litres per day.
- ▶ Safe water is one which does not harm the consumer even if ingested for prolonged periods.
- ▶ Wholesome water is one which is agreeable to use since it does not have unpleasant taste or appearance.

Sources of water supply

1. Above the surface: Rain
2. Surface water: Reservoirs, rivers, streams, ponds, tanks and lakes.
3. Ground water: Wells and springs

Water Pollution

- ▶ When natural colour and taste of water is changed and bad smell comes out from water due to any kind of contamination higher than the permitted limits it is known as water pollution.
- ▶ Water is said to be polluted when it is contaminated with-
 - Dissolved gases like H_2S , CO_2 and NH_3 .
 - Dissolved minerals like sodium, calcium and magnesium salts.
 - Suspended impurities like clay, sand and mud.
 - Microorganisms and organic matter.

Sources of water pollution

- ▶ Sewage containing organic matter and pathogenic agents.
- ▶ Industrial and trade waste
- ▶ Agricultural pollutants such fertilisers and pesticides
- ▶ Physical pollutants like heat and radioactive materials

Water borne diseases:

A. Diseases due to presence of infectious agents:

- 1) Bacterial diseases: Diarrhoea, dysentery, cholera, typhoid etc.
- 2) Viral diseases: Poliomyelitis, viral hepatitis.
- 3) Protozoal diseases: Amoebiasis, giardiasis
- 4) Worm infestations: Round worm, thread worm, tape worm etc.

B. Diseases due to presence of chemical agents: lead, arsenic, cadmium, chromium, copper, mercury etc.

PURIFICATION OF WATER

Water is purified on large scale and small scale.

- 1) Large scale purification of water
- 2) Small scale purification of water

1. Large scale
purification of water

a) Storage

b) Filtration

c) Chlorination

a) Storage

- ▶ The water from the source, usually a river, canal or stream is collected in natural or artificial large open reservoirs known as settling tanks.
- ▶ The water is allowed to remain there for 1 to 2 days.
- ▶ During this period the water purification takes place by oxidation by bacteria with the help of dissolved oxygen in water.
- ▶ The turbidity of water also decreases.

b) Filtration

- ▶ It is the second stage in the purification of water and is very important stage because 99% bacteria are removed at this stage.
- ▶ Two types of filters are used i.e.
 - i. Slow sand filters
 - ii. Rapid sand filters

i. Slow sand filters

- ▶ Slow sand filter includes 5 layers
- ▶ 5 layers include the supernatant water, each bed of fine sand and coarse sand, then each bed of fine and coarse gravel.
- ▶ The most important part of this filter is the sand bed.
- ▶ A thin green slimy gelatinous layer will form on the surface of the sand and the process of formation of this layer is called 'ripening'.
- ▶ This layer is formed within 2-3 days on a new filter bed and is about 2-3 cm in thickness. As this thickness increases the filtration decreases.
- ▶ When thickness increases to great amount then the top sand layer is scraped off. This should be repeated.

- ▶ **Adv:** practicable for developing countries, yield 98-99% bacteria free water
- ▶ **Disadv:** More land is required for their construction so initial cost is more and require periodical cleaning.

ii. Rapid sand filter

- ▶ 2 types of rapid sand filters i.e. Gravity type e.g. Paterson's filter and pressure type e.g. Candy's filter.
- ▶ Paterson's type filter is most commonly used and it involves 5 steps i.e.
 - ❖ Coagulation
 - ❖ Mixing
 - ❖ Flocculation
 - ❖ Sedimentation
 - ❖ Filtration

- ❖ **Coagulation:** water treated with alum (5-40 mg/L) to remove turbidity and colour.
- ❖ **Mixing:** The alum treated water is then agitated mechanically in a mixing chamber for few minutes so as to dissolve the alum and the impurities get precipitated.
- ❖ **Flocculation:** then passed in the flocculation chamber where it is stirred at a slow speed for about half an hour so as to form flocules of aluminium hydroxide.
- ❖ **Sedimentation:** Coagulated water is then led to the settlement tank where the precipitates are allowed to settle at the bottom.
- ❖ **Filtration:** clarified water is led to the rapid sand filter which purifies the 98-99% of water.

Adv:

- ▶ little space is required
- ▶ Cost is less
- ▶ Suitable for turbid water
- ▶ Water is filtered rapidly
- ▶ Cleaning the filter is easy.

Disadv:

- ▶ Running cost is high
- ▶ Alum is required
- ▶ Chlorination is required.

c) Chlorination

- ▶ Chlorination is the most effective methods of water purification.
- ▶ It supplements sand filtration by killing pathogenic bacteria.
- ▶ When chlorine is added to water, it leads to formation of HCl and hypochlorous acids. The HCl is neutralized by the alkalinity of water.
- ▶ The hypochlorous acid ionizes to form hydrogen and hypochlorite ions.



- ▶ Hypochlorous acid is mainly responsible for disinfectant action of chlorine.

2. Small scale Purification of water

- a) Boiling
- b) Distillation
- c) Filtration through muslin cloth
- d) Chemicals
- e) Domestic filters

Disinfection of wells

i. Measurement of well of its depth:

Diameter of the well is measured and then its depth is measured in meters with the help of rope.

ii. Amount of water in the well:

$$V = \pi r^2 h * 1000 \text{ litres}$$

iii. Amount of bleaching powder required:

10 gm of bleaching powder is sufficient to disinfect 1500 litres of water

iv. Mixing of bleaching powder:

Take required amount of bleaching powder and then add small amount of water to make paste. Then add 3/4th of water and stir it. Then allow to stand the contents of the bucket for 5-10 minutes to settle the lime. Transfer the supernatant clear liquid (chlorine solution) into another bucket and discard the sediment.

v. **Addition of chlorine solution in the well:**

Add the chlorine solution in the well and agitate the water by lowering and drawing up the bucket several times.

At least one hour the chlorine solution be kept in contact with the well water.

vi. **Ortho toludine test:**

After one hour contact period ortho toludine test is performed to know whether water has been properly chlorinated or not.

Hardness of water

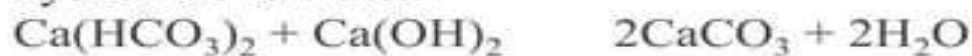
- ▶ Water which produces lather with difficulty is known as hard water.
- ▶ Water which produces lather readily with soap is known as soft water.
- ▶ Hardness of water is due to presence of soluble salts i.e. Bicarbonates, chlorides and sulphates of calcium and magnesium.
- ▶ There are 2 types of hardness of water:
 - a) Temporary hardness
 - b) Permanent hardness

a) **Temporary hardness:** due to presence of bicarbonates of calcium and magnesium

- It can be removed by boiling. On boiling CO_2 is expelled out of water and precipitates of calcium carbonate are deposited at the bottom.



- Also can be removed by adding lime or calcium hydroxide to water.



b) **Permanent hardness:** due to presence of chlorides and sulphates of calcium and magnesium.

- Sodium carbonate is added to water it removes both temporary and permanent hardness of water.



Air

- ▶ Air is the most important component of man's environment as well as all living organisms.
- ▶ Air is vital to maintain life and serves to ensure constant supply of oxygen to the body through the process of respiration.
- ▶ Composition of air:

Air is a mechanical mixture of gases.

Nitrogen - 79%

Oxygen - 20.95%

Carbon Dioxide – 0.03 to 0.04%

Air pollution

- ▶ The term air pollution is applied when there is an excessive concentration of foreign matter in the air which is harmful to health.
- ▶ Sources of Air pollution:
 - i. Industrial outlets: Chemical, textile, oil and fertilizers etc
 - ii. Combustion: Coal, oil and other fuels
 - iii. Motor vehicles: Both heavy and light motor vehicles like trucks, air, crafts and trains.
 - iv. Miscellaneous: Agricultural activities like crop spraying and pest control.

Effects of air pollution

- ▶ Mortality and morbidity rates are increased.
- ▶ Affects respiratory functions.
- ▶ It leads to destruction of plant and animal life. Production of crops is greatly affected.
- ▶ It leads to corrosion of metals.
- ▶ Polluted air causes great damage to the buildings e.g. The Taj is affected by fumes of oil refinery.
- ▶ Air Borne diseases: Chronic bronchitis, tuberculosis, smallpox, chicken pox, measles, whooping cough, pneumonia, common cold, conjunctivitis etc.

Prevention and control of Air pollution

- ▶ Health education about the harmful effects of air pollution.
- ▶ Proper ventilators should be provided in crowded rooms.
- ▶ Burning of agricultural wastes in the fields should be stopped.
- ▶ Cutting of trees should be stopped.
- ▶ Smoking at public places must be prohibited.
- ▶ Emission of smoke, harmful and toxic substances in the industries must be checked by enforcing laws.

Noise

- ▶ A sound becomes noise when it causes disturbances or annoyance to the hearer.
- ▶ The wrong sound in wrong place and at wrong time is also called noise.
- ▶ The sensitivity to noise varies from person to person.
- ▶ A sound may disturb a person but may be agreeable to the other.
- ▶ Noise is measured in decibel (dB).
- ▶ Maximum recommended noise level is 85 decibel.
Uncomfortable – 100-120 dB
Painful to ears – 130-140 dB
Rupture the tympanic membrane – 160 dB

Effects of Noise

- ▶ Loud noise may cause direct injury to the auditory organs resulting in deafness.
- ▶ Prolonged exposure to the noise of 80 dB or more is likely to be harmful and may produce fatigue, headache, vertigo and deafness.
- ▶ Leads to annoyance and irritability
- ▶ Interferes with speech
- ▶ Inability to concentrate
- ▶ Sleep disturbances
- ▶ Habit of loud speaking develops.
- ▶ Certain physiological changes like increase in BP, Heart rate, sweat, nausea etc.

Prevention and control

- ▶ Control the source of noise: It can be done by segregating the noisy machines.
- ▶ Sound absorbers should be installed in the industries.
- ▶ Protection of Exposure: By ear plugs and ear muffs.
- ▶ No Horn or silent zones near hospitals, schools etc should be demarcated.
- ▶ Legislation to restrict the use of loudspeakers etc.
- ▶ Public awareness through films and newspapers about the hazards of noise pollution.
- ▶ Noise pollution by the vehicle should be checked.

The background features abstract, overlapping geometric shapes in various shades of blue, including light blue, medium blue, and dark blue, set against a white central area.

Sewage and solid waste disposal

Solid Waste

- ▶ Unwanted solid and liquid material from household, streets, commercial industries is called waste.
- ▶ Solid waste refers to *discarded waste material* from houses, street, commercial, industrial and agricultural operations.
- ▶ It comprises of dust, ash, vegetables and paper and packing of all kinds of rags and other fabrics, glass etc.
- ▶ In city it is called refuse, in country side it is called litter.

Solid Waste

Health hazards due to solid waste accumulation:

- ▶ Organic matter of solid wastes ferments and favours the breeding of flies
- ▶ Garbage in the refuse attracts rat and pigs
- ▶ Pathogens from refuse may be carried to man through house flies and dust
- ▶ Risk of air and water pollution through combustion and fermentation of refuse

Solid Waste

Prevention:

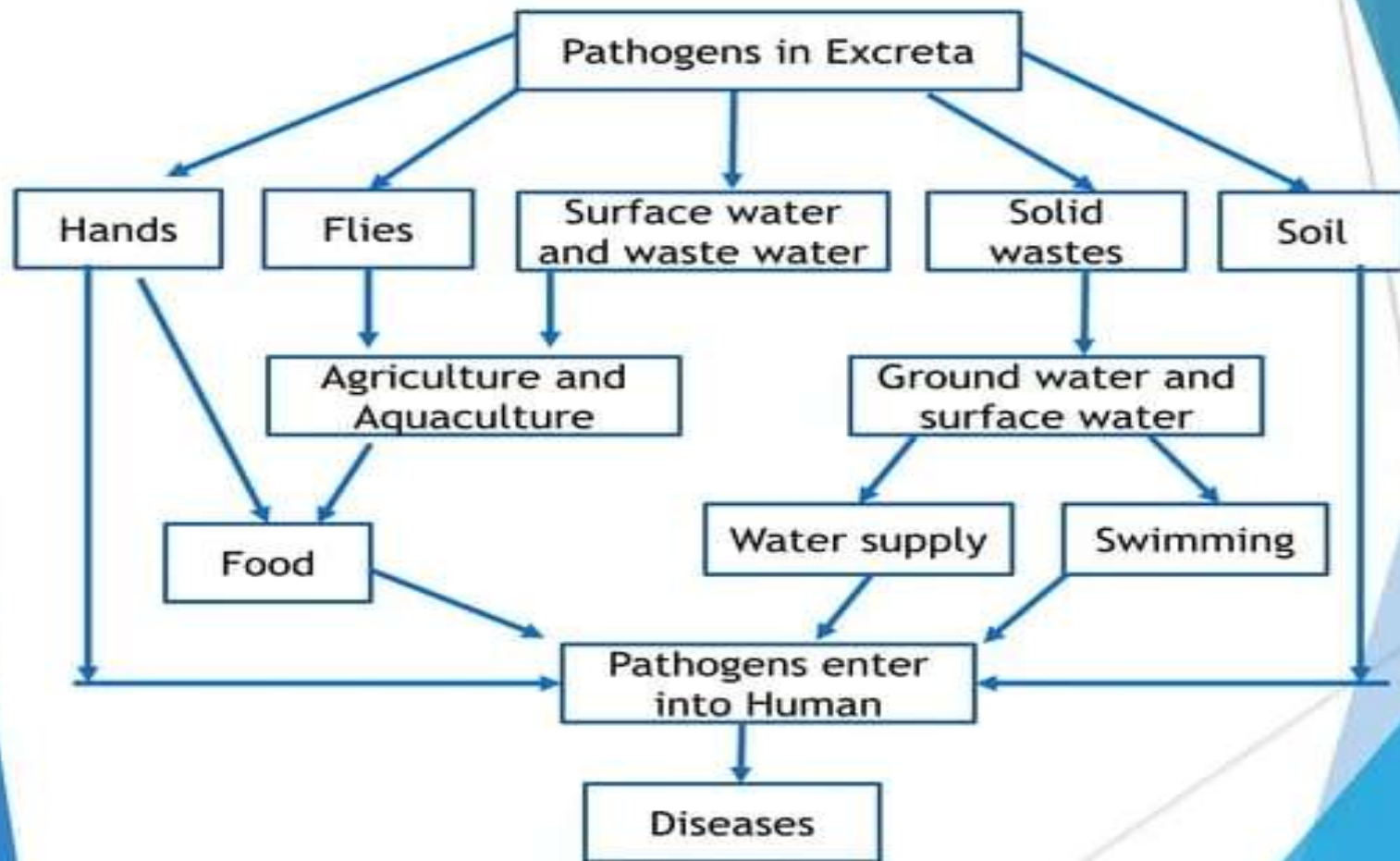
- ▶ Storage and collection of refuse
- ▶ Disposal of refuse:
 - ✓ Dumping
 - ✓ Controlled tipping
 - ✓ Burial
 - ✓ Compositing
 - ✓ Burning

Excreta

Problems of excreta:

- ▶ Soil pollution
- ▶ Water pollution
- ▶ Contamination of foods
- ▶ Propagation of flies, rodents etc
- ▶ Its results in number of diseases like typhoid, dysentery, cholera etc.

Transmission of excreta related diseases



Excreta disposal

- ▶ Excreta can be disposed by variety of latrines.
- ▶ These latrines are classified as:
 1. Service type: Bucket latrine
 2. Non-service type: Bore hole latrine
Dug well latrine
Water seal latrine

1. **Bucket latrine:**

- It is a service type of latrine also known as conservancy system.
- These latrines contain a bucket from which night soil is removed by human agency.
- Disadvantage: Exposure to flies
Soil and water contamination
Buckets need frequent replacement
Adequate staff needed for collection

2. Bore hole latrine:

It consists of circular hole of about 16 inches in diameter and 20 feet in depth.

- A concrete squatting plate with a central opening and foot plate is placed over the hole.
- A suitable enclosure is put up for privacy.
- This type of latrine is useful for a family of 5 to people for about one year.

3. Dug well latrine:

- It is an improvement over bore-hole latrine.
- It consists of circular pit of 30 inches diameter and 10 to 12 feet deep.
- This pit is lined with pottery rings.
- A concrete squatting plate is placed on the top of the pit.
- The latrine is enclosed with a suitable structure for privacy.
- This type of latrine may serve for 5 years.

4. Water seal latrine:

- ✓ It is an improved form of sanitary latrine.
- ✓ 2 types: PRAI (Planning and research action institute of lucknow)
RCA (Designed by Research – cum- action projects in environmental sanitation of health ministry)

RCA type latrine:

- **Squatting plate with pan:** 3 feet * 3 feet
- **Trap:** bent pipe of about 3 inches and connected to the pan. It contains water and act as water seal. It will prevent access to flies and also suppress bad odour.
- **Connecting pipe:** Trap is connected to the dug well pit by means of connecting pipe. It is 3 inches in diameter and 3 feet length with bend at the end.
- **Dug well pit:** 30 inches in diameter and 10 to 12 feet deep.
- Super structure.

The background features abstract, overlapping geometric shapes in various shades of blue, ranging from light to dark, creating a modern and professional look. The shapes are primarily triangles and polygons, some with thin white lines intersecting them.

OCCUPATIONAL ILLNESSES

Occupation Illnesses

- ▶ Occupational disease is a disease caused as a result of an exposure to risk factors arising from work.
- ▶ Requires causal relationship between the disease and the exposure of the worker to certain hazardous agents at the workplace.
- ▶ This relationship is normally established on the basis of clinical and pathological data, occupational history, job analysis, identification and evaluation of occupational hazards as well as exposure verification.

Occupation diseases in India

- ▶ Silicosis
- ▶ Musculo-skeletal injuries
- ▶ Coal workers' Pneumoconiosis
- ▶ Chronic obstructive lung diseases
- ▶ Asbestosis
- ▶ Byssinosis
- ▶ Pesticide poisoning
- ▶ Noise induced hearing loss

Occupation diseases

- ▶ International labour organization prepares and updates a list of occupational diseases and its classification from time to time.
- ▶ Latest classification published in 2010.
- ▶ It classifies the occupation diseases under four headings as follows:

Occupation diseases

- 1) Occupational diseases caused by exposure to agents arising from work activities
- 2) Occupational diseases by targeting organ systems
- 3) Mental and Behavioural disorders
- 4) Occupational Cancer
 - Cancer caused by the various agents (21 types)
- 5) Others

Occupation diseases

- 1) Occupational diseases caused by exposure to agents arising from work activities
 - i. Disease caused by chemical agents (43 types)
 - ii. Diseases caused by physical agents (7 types)
 - iii. Biological agents and infectious or parasitic diseases (9 types)

Occupation diseases

- 2) Occupational diseases by targeting organ systems
 - i. Respiratory diseases (12 types)
 - ii. Skin diseases (4 types)
 - iii. Musculoskeletal disorders (8 types)

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ENVIRONMENT POLLUTION DUE TO PHARMACEUTICALS

Environmental Pollution due to pharmaceuticals

- ▶ The presence of pharmaceuticals in the environment is an increasing concern.
- ▶ Several pharmaceuticals widely used in high quantity and are continuously discharged in domestic water.
- ▶ Pharmaceuticals are detectable in untreated biologically treated municipal waste water, surface water, ground water and even marine system.

Pharmaceutical source:

- ▶ Drugs for human use and drugs for animal use are main source of contamination
- ▶ Waste water from pharmaceutical companies
- ▶ Health care institutions (Hospitals and Nursing homes)
- ▶ Agriculture and agro products

Effects of pharmaceuticals exposure in the environment:

- ▶ Acute and chronic toxicity
- ▶ Effect on drinking water
- ▶ Eco-toxicological effects: effects on fish and aquatic life
- ▶ Pharmacological effects
- ▶ Drug/Antibiotic resistance development of microorganisms
- ▶ Long term effects: Adverse genetic effects, Carcinogenicity

Solution to pharmaceuticals pollution in the environment:

- ▶ Proper drug disposal
- ▶ Proper legislation and regulation
- ▶ Limit use of drugs

THANK YOU

The background features abstract, overlapping geometric shapes in various shades of blue, ranging from light sky blue to deep navy blue. These shapes are primarily located on the right side of the frame, creating a modern, dynamic feel. The rest of the background is plain white.