

- Pathogens





A manhole cover unable to contain a sanitary sewer overflow.

- Disease-causing microorganisms are referred to as pathogens. Although the vast majority of bacteria are either harmless or beneficial, a few pathogenic bacteria can cause disease.
- Coliform bacteria, which are not an actual cause of disease, are commonly used as a bacterial indicator of water pollution.

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- **High levels of pathogens may result from :**
- **1-On-site sanitation systems (septic tanks, pit latrines) or inadequately treated sewage discharges.** This can be caused by a sewage plant designed with less than secondary treatment (more typical in less-developed countries).
- **2-In developed countries,** older cities with aging infrastructure may have leaky sewage collection systems (pipes, pumps, valves), which can cause sanitary sewer overflows.
- **3-Some cities also have combined sewers,** which may discharge untreated sewage during rain storms.
- **4-Pathogen discharges** may also be caused by poorly managed livestock operations.

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- **Organic, inorganic and macroscopic water contaminants**
- Contaminants may include organic and inorganic substances.
- **1-Organic water pollutants include:**
 - a- Detergents
 - b- Disinfection by-products found in chemically disinfected drinking water, such as chloroform
 - c- Food processing waste, which can include oxygen-demanding substances, fats and grease
 - d- Insecticides and herbicides, a huge range of organohalides and other chemical compounds

- e- **Petroleum** hydrocarbons, including fuels (gasoline, diesel fuel, jet fuels, and fuel oil) and lubricants (motor oil), and fuel combustion byproducts, from storm water runoff^[17]
- f- **Volatile organic compounds**, such as industrial solvents, from improper storage.
- g- **Chlorinated solvents**, which are dense non-aqueous phase liquids, may fall to the bottom of reservoirs, since they don't mix well with water and are denser.
 - 1-Polychlorinated biphenyl (PCBs)
 - 2-Trichloroethylene
- h- **Perchlorate**
- i- **Various chemical compounds** found in personal hygiene and cosmetic products
- j- **Drug pollution** involving pharmaceutical drugs and their metabolites.
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- **2-Inorganic water pollutants include:**
- a- **Acidity** caused by industrial discharges (especially sulfur dioxide from power plants)
- b- **Ammonia** from food processing waste.
- c- **Chemical waste** as industrial by-products
- d- **Fertilizers** containing nutrients--nitrates and phosphates—which are found in storm water runoff from agriculture, as well as commercial and residential use^[17]
- e- **Heavy metals** from motor vehicles (via urban storm water runoff)^{[17][18]} and acid mine drainage
- f- **Silt** (**sediment**) in runoff from construction sites, logging, slash and burn practices or land clearing sites.

- **Macroscopic pollution** (large visible items polluting the water) may be termed "**floatables**" in an urban storm water context, or marine debris when found on the open seas, and can include such items as:
 1. Trash or garbage (e.g. paper, plastic, or food waste) discarded by people on the ground, along with accidental or intentional dumping of rubbish, that are washed by rainfall into storm drains and eventually discharged into surface waters
 - 2- Nurdles, small ubiquitous waterborne plastic pellets
 - 3- Shipwrecks, large derelict ships.

- **Thermal pollution of water**
- **Thermal pollution:** is the rise or fall in the temperature of a natural body of water caused by human influence. Thermal pollution, unlike chemical pollution, results in a change in the physical properties of water. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers..

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Elevated water temperatures decrease oxygen levels, which can kill fish and alter food chain composition, reduce species biodiversity, and foster invasion by new thermophilic species. Urban runoff may also elevate temperature in surface waters. Thermal pollution can also be caused by the release of very cold water from the base of reservoirs into warmer rivers

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