

Effect Of TDS On Human Immune System

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Abstract

Evaluation of total dissolved solids (TDS) represents measurement of the concentrations of common dissolved ions (e.g., sodium, potassium, calcium, magnesium, chloride, sulfate, and bicarbonate) in freshwaters due to which toxicity increases and causes a serious damage to environment and human health. It comes from different inorganic and organic sources including human waste, agricultural waste, industrial waste etc. High TDS water is not fit for drinking purpose. According to change in TDS level, the mineral concentration of water also alter which intern change the health value, can cause different disease and problems related to immune system.

Keywords – Effects of TDS, Sources of TDS, TDS level in drinking water, TDS (Total Dissolved Solid)

1- WHAT IS TDS?

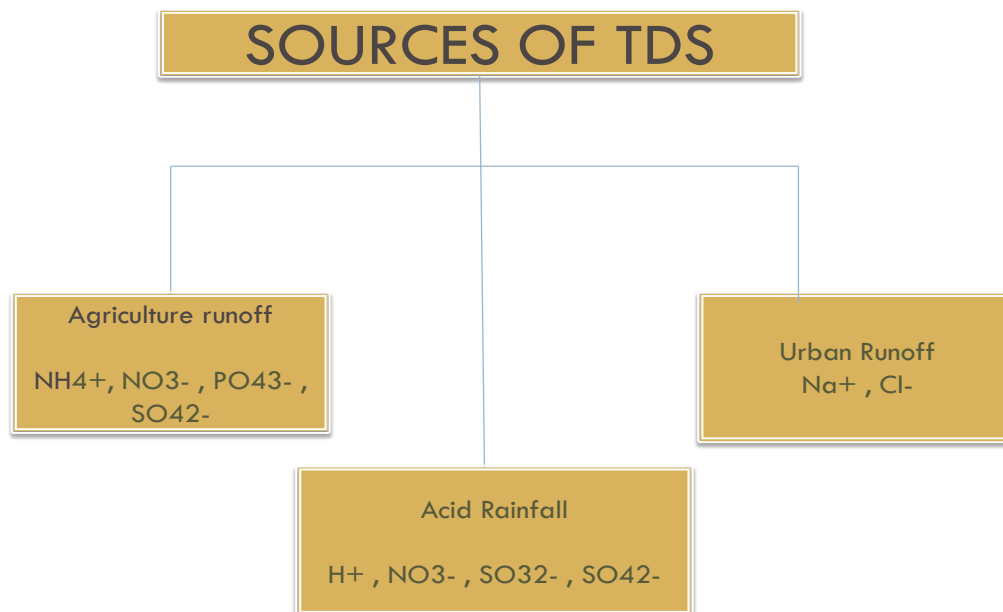
TDS means total dissolved solids which are the measure of total amount of dissolved inorganic and organic ions which includes minerals, salts or metals contained in a liquid. TDS contains common inorganic constituents that can be found in water are usually cations (positively charged) includes calcium, magnesium, potassium and sodium and anions (negatively charged) includes carbonates, nitrates, bicarbonates, chlorides, sulfates and small amount of organic matter. TDS is expressed in units of mg per unit volume (mg/L) or also referred as parts per million (ppm). TDS is directly related to the purity and quality of water and affects everything that consumes, lives in, or uses water, whether organic or inorganic, whether for better or for worse.

Total dissolved solid is the sum of concentration of cations and anions in the water. Therefore, TDS test is used as an indicator test to measure the purity and

quality measure of the amount of dissolved ions but does not tell us the nature of ion. This test does not provide the specific water quality issues, such as hardness, Salty Taste, or Corrosiveness.

2- SOURCES OF TDS

Total dissolved solid (TDS) come from number of sources such as leaves, industrial waste water, sewage discharge, urban and residential areas run-off, de-icing salts used on street during the winter, chemicals used in farms, fertilizers and pesticides used on farms and also come from mineral spring that contains high level of TDS because water flowed through rocks where salt content is very high and air that contain calcium bicarbonate, nitrogen, iron, phosphorous, and sulfur etc. These minerals form salts, which contain both a metal and a non-metal. Salts usually dissolve in water and forming ions. Ions may be positively or negatively charged. Water picks up the metals through pipes such as lead or copper



2.1- AGRICULTURE RUNOFF

Agricultural Runoff is the water from melted snow, rain and farm fields due to irrigation. This runoff water is not absorbed by soil but runs over the ground through loose soil. It contains fertilizers, pesticides, sediments, antibiotic residue, animal waste, or soil particles, which contaminate the sources of drinking water and causes water pollution. Synthetic farm fertilizers have **nitrates** and phosphorous which dissolve into soil. Nitrogen is an important nutrient for plant growth but excess nitrogen can combine with organic materials and form nitrates, which can be harmful to drinking water systems. This runoff is the primary source of deposits pollution in river, lakes and underground water sources. As agriculture runoff cross their way into rivers, lakes and underground sources of drinking water, they merge into drinking water and pollute it. Then, water treatment centers spent millions to remove these deposits from drinking water.



Fig. 1(a)



Fig. 1(b)

2.2- URBAN RUNOFF

Urban runoff is created due to excess of storm water, melt water, or rainwater flows through impervious surfaces in which some surfaces contains gasoline, motor oil, metals, while lawns contains fertilizers and pesticides. Urban runoff includes plant material, fertilizers, pesticides, automotive and household chemicals, litter, and pet waste. During July 2009 to June 2010, it has been observed that storm water from impervious surfaces also contains soluble salts like – potassium (K), sodium (Na), cadmium (Cd), magnesium (Mg), chloride (Cl⁻), sulphate (SO₄²⁻) in runoff which degrade the aquatic ecosystem dramatically. In these soluble salts, the concentration of sodium and chloride ions is high [1-2]. This runoff is the one of the leading source of flooding and water pollution. When this runoff traveling across the urban environment, then it get contaminated and have an effect on water quality.



Fig. 2(a)



Fig. 2(b)

2.3- ACID RAINFALL

A number of human activities also have a dangerous effect on water and air. When sulphur dioxide, nitrogen oxide and many other harmful gases are emitted from industries, power stations, factories and vehicles, causes air and water pollution. These gases react with tiny droplets of rain and form nitric and sulphuric acids, lower the pH of water and acid rain can be produced which damage to the environment. Plants and animals are harmed or even killed and fewer and fewer organisms can survive due to acidification. Acidic water has low pH and having certain substances and gases which is very harmful. For example, aluminum, lead and mercury are dangerous substances and have extremely negative consequences for aquatic life.

In actual, slightly acidic water is not so harmful but it can be quite hazardous when it combines with other compounds.

- When pH of water is less than 6.5, it discharges metal ions (iron, manganese, copper, lead, zinc) and having bitter, metallic taste and corrosion.
- When pH of water is greater than 8.0, it can be difficult to make germ-free and having soda-like taste and deposits. Then, World Health Organization recommends that the pH of the water should be less than 8.0, because basic water does not allow for effective chlorination.

It means we have to increase the pH of water and make it basic. pH is commonly increased by using sodium carbonate and sodium hydroxide but calcium and magnesium carbonate is the better way to deal with low pH which will increase the pH level as well as make the water less corrosive. So, calcium and magnesium carbonate are of health benefits as contrasting to sodium.

3- WHAT SHOULD BE THE TDS LEVEL IN WATER?

Total Dissolved Solids are occurring in

nature, e.g. - Minerals, Salts, etc. TDS concentration is not hazardous to human health in permissible amounts but its high concentration is completely unacceptable and dangerous to human body. The high concentration of total dissolved solids can cause water to become corrosive, salty and develop a brackish taste. This results in the formation of hard water which leaves deposits on fixtures, water pipes and boilers and has harmful contaminants, such as iron, manganese, sulphate, bromide and arsenic present in water.

- The TDS level less than 150 is totally unacceptable level because in this range required minerals is not present in water which is safe to drink but not pure and healthy for a human body.
- TDS level above 1200 range is not fit for drinking because of too much impurities and minerals which is not healthy for human body but latest RO filters can reduce the TDS level of this range.

CHART FOR TDS LEVEL

Below 150	Unacceptable (too less minerals)
150 to 300	Excellent
300 to 600	Good
600 to 900	Fair
900 to 1200	Poor
Above 1200	Unacceptable (too much impurities and minerals)

Table 1 – TDS level in water

4- EFFECT OF TDS ON HUMAN IMMUNE SYSTEM

Today, one of the major problems is that drinking water is not safe. It is water that makes our life possible. As we know that human body consists of 60 to 70 % water. Water helps to maintain the temperature in human body and keeps the body hydrated. Water keeps all the tissues moist and also maintains the level of moisture in most sensitive areas i.e. – eyes, nose and mouth etc. In addition to this, water helps in transport the oxygen to the cells and removes the waste from the body.

In current years, the world facing major water problems in which drinking water

has become the biggest issue. Water is essential for human life, growth and health but it can also be the cause of spreading diseases. Health issues associated with drinking water increasing day by day. Water related problems kills millions of people every year. So, every effort should be made to maintain the quality of drinking water.

Now days, water is highly contaminated because it contains infective and parasitic agents, chemical substance (high level of nitrates, fluoride, arsenic, selenium) industrial or other waste or sewerage. Due to that contaminated water, millions of people are suffered from water borne

diseases which is spreading at very fast rate in whole over the world.

- High concentration of fluoride in drinking water causes skin diseases and dental fluorosis.
- High concentration of nitrates in drinking water causes methamoglobinemia (Blue baby diseases) where the skin becomes blue due to decreased efficiency of hemoglobin to combine with oxygen. It may also increase risk of cancer.
- High concentration of iron may causes digestive disorders and it can also damage the blood tissues.
- High concentration of heavy metals damage kidney and other metallic disruption.
- Pesticides in drinking water may cause several problems in human body – it weakened the immunity and abnormal multiplication of cells.
- High concentration of chlorides may cause reproductive and endocrinal damage.
- High concentration of arsenic may cause acute health effects (like – nausea, skin rashes, vomiting, abdominal pain etc.) It may also increases the risk of skin cancer, kidney cancer and lungs, urinary bladder cancer.

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