

Total Dissolved Solids

Sources

Total dissolved solids (TDS) is the term used to describe the inorganic salts (mainly sodium chloride, calcium, magnesium, and potassium) and small amounts of organic matter that are dissolved in water. Technically, anything that dissolves in water contributes to the TDS level.

There are areas of the world that have naturally high amounts of TDS in their drinking water. TDS in drinking water comes from natural sources, and to a lesser extent from sewage, urban runoff, and industrial wastewater. Brackish or saline aquifers can exist naturally or develop over time in coastal regions with sea water infiltration due to lowering aquifer depths.

- Fresh: <1,000 mg/L TDS
- Brackish: 1,000–5,000 mg/L TDS
- Highly Brackish: 5,000–15,000 mg/L TDS
- Saline: 15,000–30,000 mg/L TDS
- Sea Water: 30,000–40,000 mg/L TDS *(Water Quality Association, nd)*

Fresh water with high or low levels of TDS is often called “hard” or “soft” water, respectively. Hard water received this name because it requires more soap to get a good lather and makes the water “hard” to work with. Soap is less effective with hard water due to its reaction with the magnesium and calcium, leading to high use of soap for laundry and bathing. As well, hard water (>500 mg/L) can leave a residue and cause scale to build up on household appliances (e.g., electric kettle, dishwasher), cooking pots, and water pipes.

Soft water is usually preferred for laundry, bathing and cooking.

Potential Health Effects

Although there are no direct health concerns of drinking water with high concentrations of TDS, the presence of dissolved solids in water may affect its taste. People generally prefer the taste of hard water due to the dissolved minerals, however high concentrations of TDS can cause a bitter or salty taste. According to the World Health Organization (2003), the acceptability of drinking water has been rated by a panel of tasters in relation to its TDS concentrations as follows:

- Excellent: <300 mg/L
- Good: 300-600 mg/L
- Fair: 600-900 mg/L
- Poor: 900-1,200 mg/L (e.g., brackish water)
- Unacceptable: >1,200 mg/L (e.g., saline water)





Some people can taste salt in drinking water at levels around 500 mg/L, and it may cause them to not use it and choose another, possibly contaminated, water source instead.

Water with extremely low TDS concentrations (e.g., rainwater) may also be unacceptable because of its flat taste.

World Health Organization Guidelines

The World Health Organization (WHO) does not have a suggested guideline for total dissolved solids since it occurs in drinking water at concentrations well below those at which health effects may occur. Most people will reject drinking water due to odour, taste, and colour at a level much lower than is required for harm. People usually do not like the taste of water that has more than 600 mg/L of TDS (WHO,2017).

No WHO Guideline for Total Dissolved Solids in Drinking Water

Water Quality Testing Methods

Dissolved ions increase the electrical conductivity (EC) of water, which is easily measured with a digital meter, so testing for EC is often done instead of testing directly for TDS. EC in microsiemens per centimetre ($\mu\text{S}/\text{cm}$) usually ranges from 1 to 2 times the TDS in mg/L (UNICEF, 2008).

Testing for EC does not give specific information about the chemicals present in water, but it gives an estimation of the TDS. More specific testing must be done to discover which chemicals are present.

Household Water Treatment Options

There are some limited household options to remove total dissolved solids from drinking water. Filtration does not work since the chemicals and organic matter are dissolved in the water. Distillation technologies can help reduce TDS levels in drinking water; however they may not be practical or easy to use at the household level. Reverse osmosis systems are becoming popular in industrialized countries for removing TDS, however they are relatively expensive and require a power supply.



References

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