Classification of Contaminants

Water is a very simple molecule (two hydrogen atoms combined with one oxygen atom), but that simple combination allows the emergence of exceptional properties that have made water the most important solvent on earth and an essential support to the development of life.

Inorganic Ions: Inorganic ions, commonly present in tap water, are cations, such as sodium, calcium, magnesium or iron and anions, such as bicarbonate, chloride and sulfate. Many other ions can be present depending on the water source. Inorganic ions, even at trace levels, may affect both organic and biochemical reactions by acting as catalysts.

Organics: Dissolved organic molecules present in tap water are mainly of biological origin. Molecules including humic acids, tannins and lignin are the by-products of the decay of plants. However, man-made contaminants may be introduced by the pipes carrying the water. For example, PVC pipes may leak their phthalate esters plasticizers into the water. Dissolved organics can affect biological experiments such as cell culture and disturb analytical techniques. Even moderate organic contamination present in water used to prepare Liquid Chromatography eluents can cause baseline instability and decrease sensitivity and resolution, therefore decreasing chromatography column lifetime.

Particulates and Colloids: Natural water usually contains soft particulates (vegetal debris) and hard particulates (sand, rock) as well as colloids that can interfere with instrument operation.

Bacteria and their By-Products: Bacteria contaminate natural water, especially surface water. The chlorination process will ensure removal of harmful bacteria, but tap water still contains live micro-organisms. Bacteria can cause different issues in laboratory experiments either directly or through their by-products, such as pyrogens, nucleases or alkaline phosphatase.

Gases: Natural water contains dissolved gases such as nitrogen, oxygen and carbon dioxide. The concentration of oxygen can affect specific biochemical reactions and nitrogen can form bubbles that are detrimental to processes such as particulate counting or spectrophotometric measurements.

Electrical conductivity: Is a measure of a material's ability to conduct an electric current. Water itself has a weak electrical conductivity. Electric current is transported in water by dissolved ions, making conductivity measurement a quick and reliable way to monitor the total amount of ionic contaminants in water.