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Environmental Contaminants



The following environmental contaminants referred to as “Emergent Chemicals” have recently become compounds of concern due to their detection in groundwater and surface water. These compounds are associated with military and industrial facilities and all have acute to chronic health effects in humans. State governments have set varying limits for these compounds, with California having some of the lowest regulatory limits.

Columbia Analytical has modified and developed methods to detect these analytes at or below most state regulatory levels.

Emergent Chemical

Test Method

Reporting Limit

Perchlorate	EPA 314.0 / EPA Proposed 6850	2.0 µg/L / 0.5 µg/L
N-Nitrosodimethylamine (NDMA) (with isotope dilution)	EPA 8270C	0.002 µg/L
Polybrominated Diphenyl Ethers (PBDE)	EPA 8270C	2.0-1000 ng/L
Hexavalent Chromium	EPA 7195	3.0 µg/L
Total Chromium	EPA 200.8	0.2 µg/L
1,2,3-Trichloropropane	EPA 8270C	0.005 µg/L
1, 4-Dioxane	EPA 8270C	1.0 µg/L
Pharmaceutical and Personal Care Products (PPCPs)	HPLC/MS/MS	0.5-10.0 ng/L

Perchlorate (ClO₄-) occurs in the environment when perchlorate salts of ammonium, potassium, magnesium or sodium dissolve in water. Major sources of perchlorate are solid propellants for rockets, missiles and fireworks. However, it also occurs naturally. Naturally occurring perchlorate may be a greater source than originally thought. Regardless of source, this pollutant is exceedingly mobile in aquifer systems. It can persist for many decades under typical groundwater and surface water conditions because of its relative stability. Perchlorate, at even extremely low concentrations, impairs normal thyroid function and may contribute to thyroid cancer. Perchlorate is among a group of unregulated chemicals requiring monitoring pursuant to Title 22, California Code of Regulations § 64450.

N-Nitrosodimethylamine, also known as NDMA (C₂H₆N₂O), is a product from the decomposition of unsymmetrical dimethyl hydrazine, a component used in the production of rocket fuel (Aerzine 50). This chemical is used as an additive in liquid propellant fuel for rocket engines. NDMA is used primarily in research (NTP, 2000), but it can also be formed inadvertently in a number of industrial processes. NDMA is identified as a carcinogen under California's Health and Safety Code Section 25249.5, et seq., and the Safe Drinking Water and Toxic Enforcement Act of 1986 ("Proposition 65"). In addition, the USEPA identifies NDMA as a "probable human carcinogen" (USEPA, 1997).

PBDEs constitute one class of brominated flame-retardants that have been used globally for the past 30 years. PBDEs are used in a variety of consumer products such as electrical appliances, building materials, and textiles in order to retard their combustion. Recently they have gained increased attention because of their persistence in the environment, potential for bioaccumulation, and potential toxicity.

Hexavalent Chromium has had wide spread, long-term use in industry for its ability to inhibit the formation of rust. It is also a known human carcinogen that has impacted drinking water aquifers in some states, resulting in well shutdowns. On February 28, 2006, OSHA published a final rule for a hexavalent chromium permissible exposure limit (PEL) in air that applies to the metal finishing industry and other sectors. The new limit is 5.0 micrograms per cubic meter (µg/m³) (as CrO₃) with an action level of 2.5 µg/m³ (as CrO₃). The new PEL is significantly lower than the level under which industry has been operating: 52 µg/m³ (as CrO₃). The NIOSH recommended exposure limit (REL) is 0.1 µg Cr(VI)/m³ for all hexavalent chromium compounds.

1,2,3 - Trichloropropane has been used primarily as a solvent and extractive agent. As a solvent, it has commonly been used as a paint and varnish remover, a cleaning and degreasing agent and a cleaning and maintenance solvent. 1,2,3-Trichloropropane is not a naturally occurring chemical. Releases to the environment are likely to occur as a result of its manufacture, formulation, use in various products, and as a chemical intermediate. 1,2,3-Trichloropropane is reasonably anticipated to be a human carcinogen based on sufficient evidence of malignant tumor formation at multiple sites in many species of experimental animals.

1, 4-Dioxane is used as a stabilizer for chlorinated solvents or volatile organic compounds (VOCs), particularly 1,1,1-trichloroethane (which accounts for usage of approximately 90% of the 1, 4-dioxane produced). Releases of chlorinated solvents or VOCs may be a primary source of 1, 4-dioxane in the environment, but it is also found in detergents, shampoos, body lotions, cosmetics, and pharmaceuticals. 1, 4-dioxane has a high potential for entering the environment due to its volatility and solubility in water. Spent chlorinated solvents disposed of improperly can contaminate ground and surface water, and 1, 4-dioxane has been detected in surface waters throughout the United States. Exposure to small amounts of 1, 4-dioxane may lead to significant adverse health effects. The primary routes of exposure include inhalation, ingestion and dermal contact.

PPCPs compounds at low concentrations can have negative effects on the endocrine systems of aquatic organisms. These compounds are collectively known as EDCs. Other concerns regarding PPCPs include contamination of drinking water, estrogenic effects on humans and wildlife, and development of antibiotic resistant bacteria. Due to their chemical nature, many of these compounds are not amenable to standard instrumental analysis for organic compounds, such as gas chromatography and gas chromatography/mass spectroscopy.

