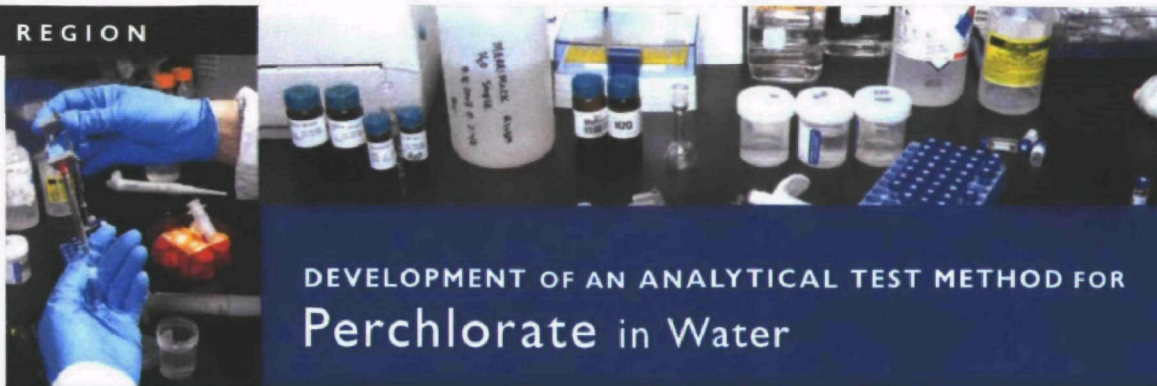


Science TO RESULTS

Using science to create a healthier environment



DEVELOPMENT OF AN ANALYTICAL TEST METHOD FOR Perchlorate in Water

U.S. EPA | SCIENCE AT THE EPA NEW ENGLAND REGIONAL OFFICE

SCIENCE lies at the heart of the mission of the U.S. Environmental Protection Agency (EPA). The Agency must rely on cutting edge research, accurate measurements and effective technology to implement its programs to protect the environment and human health. Without sound science and credible data, EPA can not wisely set environmental and health standards, clean up contaminated sites, measure ambient air and water quality conditions, or identify the new technologies or practices that will reduce releases to the environment. These fact sheets share with you some of our EPA New England's laboratory capabilities and exemplify some of the very best science we do to meet our agency mission.

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GOAL:

With concerns about perchlorate contamination of drinking water growing in the United States, chemists at EPA New England's regional laboratory have worked to develop the ability to analyze water samples for perchlorate even at very low concentrations. In partnership with EPA's Office of Ground Water and Drinking Water, regional scientists sought to determine the scientific performance and accuracy of using Liquid Chromatography Tandem Mass Spectrometry (HPLC-MS/MS) instrumentation to detect perchlorate in drinking water.

PROGRESS:

Perchlorate is a chemical typically used in the manufacture of such products as rocket fuels, fireworks and incendiary devices. Unfortunately, perchlorate is also a potentially hazardous chemical to human health and the environment. The chemical interferes with the uptake of iodine into the thyroid gland, which can lead to changes in the normal growth and development of children and undermine the metabolic process in adults. Because perchlorate is water soluble, it can easily enter and contaminate surface and groundwater drinking resources.

Given the health concerns, environmental regulators need to be able to detect the presence of perchlorate in water. Until recently, EPA and the states utilized an analytical method called Ion Chromatography (IC) to evaluate water samples for perchlorate. Unfortunately, this test method could only detect perchlorate at levels down to about 4 parts per billion (ppb). It also lacked the sensitivity and specificity to separate out interferences from metals, salts, and charged ions in the water samples being tested. This problem is called matrix interference.

To overcome these obstacles, EPA New England chemists began tests to evaluate the effectiveness of using Liquid Chromatography Tandem Mass Spectrometry (HPLC-MS/MS) in detecting perchlorate. Using water samples



EPA chemist analyzing
a water sample

from specific known sites where perchlorate contamination existed, EPA chemists analyzed for perchlorate down to 100 parts per trillion (ppt) with a high degree of specificity and confidence. More importantly, they discovered using HPLC-MS/MS resolved the problems associated with matrix interference. Working with the EPA Office of Groundwater and Drinking Water, they have since helped validate EPA drinking water Method 331.0 and applied it to numerous environmental investigations. As a result, EPA New England's regional laboratory has been designated a Center of Applied Science (CAS) for the application of this perchlorate test method to water samples.

BENEFITS:

This work has provided environmental agencies with a more robust analytical test method for perchlorate in water. EPA New England's laboratory has assisted states and other EPA regions with numerous perchlorate studies, which have advanced the knowledge of perchlorate as it impacts the environment, has enabled the agency to identify specific sources of pollution, and has assisted in the reduction of perchlorate contamination in both public and private drinking water systems.