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Perchlorate Analysis in Biological Samples Using LC-MS/MS Techniques

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The Perchlorate anion (ClO_4^- , MW 99) has been found in drinking water and food. Perchlorate is used as a solid fuel oxidant in military applications, such as rockets and missiles, and in civilian applications, such as flares, fireworks and matches. The majority of the U.S. population is expected to be exposed at low (ppb) levels of perchlorate. Exposure to perchlorate is of concern due to its ability to disrupt the function of the thyroid gland, and affect the production of thyroid hormones. Limited analysis of human specimens for perchlorate has been completed to date. In this study, liquid chromatography – tandem mass spectrometry (LC-MS/MS) methods have been developed to analyze perchlorate in human saliva, human serum and the newborn screening dried blood spot. Simple centrifuge filtration and dilution techniques are used to separate perchlorate from the sample matrix. An anion exchange column is used for chromatographic separation using a methylamine mobile phase. Tandem mass spectrometry of m/z transitions specific for perchlorate is used for detection. An ^{18}O labeled internal standard provides a relative response for the native perchlorate in the complex sample matrices. Perchlorate was successfully detected in biologic samples using a simple filtration/dilution sample preparation and LC-MS/MS techniques. Assessment of perchlorate exposure using the methods developed in this study would support regulatory and policy making initiatives that are critical to protecting human health.