Lessons Learned from the Application of Total Oxidizable Precursors (TOP) Assay on Environmental Samples

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Background/Objectives. Per- and polyfluoralkyl substances (PFAS) have been manufactured and in use for many years. The many uses include surfactants used as processing aids and in aqueous film forming foams (AFFF), water repellant coatings in consumer products and as aids in several manufacturing processes. Over that time and due to variables in production processes like electrofluorination, many different chemistries of PFAS have been produced and used. In addition to the recalcitrant perfluorocarboxylic acids (PFCA) and perfluorosulfonic acids (PFSA), chemistries such as telomer sulfonates, telomer alcohols, sulfonamides and many others have been identified. Many of these compounds have not yet been fully characterized and, therefore, analytical standards are typically not available. This presents a challenge for the accurate assessment of the total PFAS contamination or hidden mass of PFAS at environmental sites.

Approach/Activities. One of the approaches to assessing the hidden mass of PFAS is based on the transformation to the terminal acids that can be facilitated as described by Erika Houtz and David Sedlak (Environ. Sci. Technol. **46**, 9342-9349 [2012]). The oxidation process described yields an estimation of the total oxidizable precursors present in a given environmental sample. The process has been deployed in our laboratory and others as one tool available to assess the hidden mass. However, in the course of applying the technique to environmental samples, several hurdles have been encountered based on a variety of parameters observed in environmental samples. Some of these hurdles have suggested limitations in the application of the TOP assay, but really may be emblematic of the extension of the application to matrices not foreseen by the authors. The incorporation of additional parameters allows the analyst to assess the “goodness” of the analytical product, but potentially more important, may allow one to optimize the reaction conditions to sample matrix types.

Results/Lessons Learned. The presentation will describe many of the problems seen with the application of the TOP assay to a wide range of matrices Additionally, a contrast of the validation data to several sample types will be presented along with the measures taken and adjustments made within the analytical protocol to improve the effectiveness of the results that are generated.