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Exploring microbial PFAS degradation at two contaminated firefighting training sites in Sweden

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The extensive use of Aqueous Film Forming Foam (AFFF) has led to substantial contamination by per- and polyfluoroalkyl substances (PFAS) of soils and groundwater at many firefighting training sites in Sweden and worldwide. PFAS is a group of extremely persistent anthropogenic substances that pose risk for adverse effect even at low levels. There is consequently a need to understand the potential for natural degradation of these compounds and the controlling environmental factors. Understanding the microbial capacity to degrade and transform PFAS is also crucial for comprehending their transport in soil and groundwater and for the development of a potential bioremediation technique. Despite commonly referred to as “forever chemicals”, there is emerging evidence of PFAS being microbially degraded in laboratory settings. The aim of this study is to investigate the microbial degradation capacity of the natural bacteria at two firefighting training sites (FFTS) contaminated with PFAS. Utilizing a sonic drill, soil samples were collected from both above and below the water table from FFTS near Örnsköldsvik and Sundsvall Timrå airports in Sweden. Enrichment cultures were initiated by mixing these soil samples with four different growth media—two for aerobic and two for anaerobic incubations. The incubation conditions, aerobic or anaerobic, were determined dependent on if the sample was taken above or below the groundwater level. All incubations were spiked with perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), 6:2 fluorotelomer sulfonic acid (6:2FTSA) and perfluorooctane sulfonaminde (FOSA) to reach a concentration of 9ppm. Samples from the incubations were taken at monthly intervals to screen for fluoride production, as an indicator for PFAS degradation, using ion chromatography. Using this approach, we aim to uncover the capability of the natural microbial community at these sites to degrade PFAS. In the second phase of this study, this will be followed by careful analysis of degradation products with the aim to identify degradation pathways.