Testing Commonly Used Insect Repellents for 17 PFAS

Sam Bartlett (sam.bartlett@aecom.com)
(AECOM, Providence, RI, USA)
Kathy Davis (katherine.l.davis@aecom.com)
(AECOM, Newark, DE, USA)
Robert Kennedy (robert.kennedy@aecom.com)
(AECOM, Chelmsford, MA, USA)

Background/Objectives. An AECOM project team encountered a health and safety concern during preparations for a sampling event for per- and polyfluoroalkyl substances (PFAS) in groundwater in the town of Portsmouth, Rhode Island. Current PFAS sampling guidance provides suggested personal protective equipment (PPE) alternatives to minimize PFAS cross-contamination that may result from using PPE with known or suspected PFAS content. The Portsmouth site was known to have an elevated tick population and ticks had already been observed during brush clearing and pre-mobilization site visits. Permethrin and N,N-diethyl-m-toluamide (DEET) are highly effective for protecting against ticks, but these products were suspected of containing PFAS. To better protect the field team and ensure generation of reliable PFAS data, a study was completed to determine if commonly used insect repellents containing permethrin or DEET presented a concern for PFAS cross-contamination.

Approach/Activities. AECOM tested three commonly used insect repellent products to determine if the products presented a potential for PFAS cross-contamination. The products were selected based on what was commonly provided to the field teams and are as follows: Sawyer Premium Insect Repellent Clothing treatment: a do-it-yourself permethrin treatment for clothing, EPA Registration Number: 50404-3-58188; OFF! Deep Woods Insect Repellent: a DEET based spray for skin and clothing, EPA Registration Number: 4822-167; and Insect Shield Insect Repellent Apparel: clothing that is pre-treated with permethrin, EPA Registration Number: 74843-2. The Sawyer and OFF! sprays were applied as directed to strips of fabric from a well-worn t-shirt for testing and an Insect Shield hat was tested. The treated fabrics were exposed to lab-certified PFAS-free water with a 30-second contact time. The water was then containerized and analyzed. Additionally, two blanks were collected for quality control: a blank of the lab-certified PFAS-free water and a water rinsate sample of the untreated t-shirt fabric. Samples were preserved on ice, packaged, and delivered to Vista Analytical Laboratory for analysis by the EPA 537 Modified method. The Vista method uses solid phase extraction of aqueous samples followed by UPLC/MS/MS analysis and isotope dilution quantitation for target analytes.

Results/Lessons Learned. All samples analyzed were reported as non-detect (<2.5 ng/L) for the following 17 PFAS compounds: PFBA, PFPeA, PFBS, PFHxA, PFHpA, PFHxS, PFOA, PFHpS, PFOS, PFNA, PFDA, PFOSA, PFDS, PFUnA, PFDoA, PFTrDA, and PFTeDA. The study showed the tested formulations of these products did not present a risk of PFAS cross-contamination and may be used for PFAS investigations. This project also reinforced the benefit of collecting equipment blanks prior to initiating an investigation in order to better understand cross-contamination concerns and generate reliable PFAS data, and further support the health and safety of your field team. Many products once suspected of containing PFAS compounds may not pose a real significant risk of contamination during field sampling. Prudent testing before use can verify specific commercial products are free of PFAS target analytes. Analytical results and information on the product formulations that were tested will be provided at the time of the presentation.