Title: Quantifying Per- and Polyfluoroalkyl Substances in Florida Firefighters: Evidence from the Firefighter Cancer Initiative

Authors: Jingwei Gu[1]; Paola Louzado-Feliciano[1]; MS, Dingtian Cai[1]; Min Lu[1], PhD; Natasha Schaefer Solle, RN, PhD[3,4], Johanna Garibaldi, BSN, RN, EMT-P; Aimee Green, DNP, APRN, FNP-BC, ABAAHP; Erin N. Kobetz, PhD, MPH[1,3,4,]; Alberto J. Caban-Martinez[1,2,4], DO, PhD, MPH

Affiliations: Departments of [1]Public Health Sciences, [2]Physical Medicine and Rehabilitation, [3]Medicine and [4]Sylvester Comprehensive Cancer Center, University of Miami, Miller School of Medicine, Miami, FL, USA.

Background/Objective: Per- and polyfluoroalkyl substances (PFAS) are human-made chemicals found in nonstick cookware, carpet, textiles, high-performance outdoor gear, and some firefighting foams. Epidemiologic studies have linked PFAS to adverse health effects such as endocrine disruption and increased risk of cancer. Firefighters may be exposed to PFAS during fire suppression and use of personal protective equipment. We quantified PFAS levels across a sample of Florida firefighters.

Methods: During June-October 2021, we administered a one-time survey and collected blood samples from a non-probabilistic sample of active and retired Florida firefighters. The survey assessed for socio-demographics, work characteristics, and the use of products known to contain PFAS. We quantified 7 distinct PFASs using a solid-phase extraction–high-performance liquid chromatography–isotope dilution–tandem mass spectrometry approach. The 7 PFAS congeners tested were: Perfluorobutanesulfonic Acid (PFBS), Perfluoroheptanoic Acid (PFHpA), Perfluorohexanesulfonic Acid (PFHxS), Perfluorooctanoic Acid (PFNA), Perfluorononanoic Acid (PFNA), Perfluorooctanesulfonic Acid (PFOS), and Perfluoroctanesulfonamide (PFOSA).

Results: Among the 208 participants with a group mean age of 40.2 years (SD 10.3), 92.8% were male, 16.2% Hispanic/Latinx, 81.7% White, and 89.8% used AFFF at their fire department. Across firefighter subgroups, 73.5% were incumbent, 12.9% airport, 4.3% fire instructors, 2.4% recruits, 0.5% fire Investigator, and 6.25% retired. All serum analyzed had present at least five out of the seven PFAS congeners tested. Group geometric mean of each PFAS congener (in ng/mL) were: PFBS (0.09), PFHpA (0.08), PFHxS (2.17), PFOA (1.38), PFNA (0.42), PFOS (2.69), and PFOSA (0.10). PFAS concentrations was highest among the fire investigators at PFHpA (0.098), PFHxS (>10), PFOA (3.8), PFNA (1), and PFOS (6.6).

Conclusion: Across all PFAS congeners evaluated, PFHxS was highest in concentration and PFHpA was lowest, however PFAS serum concentrations varied across firefighter job tasks, where fire investigators had the highest PFOA, PFNA, and PFOS serum levels compared to other firefighter job types.

Keywords: firefighters, PFAS, fire service, occupational health, and safety

Learning Objectives:

1. Describe the concentration of each PFAS levels across the sample and by firefighter subgroup.

2. Discuss how both long- and short-chain PFAS were varied in serum concentrations in the blood serum analyzed and the potential health effects.