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## FIRE DEPARTMENT SERVICE ANNOUNCEMENT

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Bulletin #42, Firefighter Epigenomics, October 29, 2021

Although per- and polyfluoroalkyl substances (PFAS) exposures are linked to many different health outcomes, it is not well known how these exposures lead to disease. One potential mechanism involves epigenomics (EH-pih-jeh-NOH-mix) which can be defined as: “The study of all of the epigenetic changes in a cell. Epigenetic changes are changes in the way genes are switched on and off without changing the actual DNA sequence. They may be caused by age and exposure to environmental factors, such as diet, exercise, drugs, and chemicals. Epigenetic changes can affect a person’s risk of disease and may be passed from parents to their children.”<sup>1</sup>

An epigenomics study of firefighters looking at the impact of PFAS was recently released. The study measured PFAS levels and epigenetic marks (DNA methylation) in samples from 197 firefighters.<sup>2</sup> There were no airport firefighters included and the firefighters’ AFFF exposure was unknown. Concentrations of nine PFAS, including legacy [C8] and long-alkyl chain PFASs, were measured in the firefighters’ serum. A range of PFAS levels were observed, and it is unknown if they reflect exposure from AFFF, the surrounding environment, or both.

In this study, higher PFAS levels were linked to accelerated epigenetic age. Epigenetic age can be estimated from DNA methylation of key genes, and it is representative of an individual’s biological age. When epigenetic age is accelerated compared to chronological age, this is linked to many health problems including cancers, earlier mortality, cardiovascular disease, and more.

The study also reported on associations between several PFAS and the epigenetic mark, DNA methylation, at specific genes. The genes have known functions related to cancer, the immune system, and more. Whether changes could be the biological mechanisms leading to PFAS toxicity needs to be tested further.

In conclusion, PFAS may increase risk of disease through epigenetic changes, although it is always important to replicate the findings in other studies to increase the weight of evidence for this potential pathway to toxicity.

1 NIH, National Cancer Institution, accessed 25 Oct 2021, <https://www.cancer.gov/publications/dictionaries/cancer-terms/def/epigenomics>

2 Per- and polyfluoroalkyl substances, epigenetic age and DNA methylation, a cross-sectional study of firefighters, Dr. Jackie Goodrich, et al., 21 Oct 2021, <https://www.futuremedicine.com/doi/10.2217/epi-2021-0225>



A street grate in the Midwest with foam bubbling outwards.