

Research shows altered regulation of genes linked to prostate cancer among firefighters

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Firefighters may have an increased risk of prostate cancer due to on-the-job chemical exposures, according to new research from the University of Arizona Mel and Enid Zuckerman College of Public Health and

University of Michigan in collaboration with fire service partners and researchers around the country through the Fire Fighter Cancer Cohort Study.

Prostate cancer is the leading incident cancer among U.S. males. Firefighters are diagnosed with [prostate cancer](#) at a rate 1.21 times higher than the general population, possibly because of [chemical exposures](#) including smoke and firefighting foam during firefighting.

Some of those chemicals can affect how genes are expressed through a process called [epigenetic modification](#), and certain epigenetic modifications, including DNA methylation, contribute to cancer development. Researchers found evidence that experienced firefighters had different epigenetic modifications than new firefighters in regions linked to prostate cancer.

"With these published findings, we have clear evidence of the health risks that firefighters face due to cumulative exposure on the job," said Jeff Burgess, MD, MPH, director of the Center for Firefighter Health Collaborative Research and professor at the Zuckerman College of Public Health.

The paper, "Firefighting, per- and polyfluoroalkyl substances, and DNA methylation of genes associated with prostate cancer risk," [is published](#) in the journal *Environmental and Molecular Mutagenesis*.

Burgess, also a member of the BIO5 Institute, has been investigating [firefighter](#) health for decades. He collaborated with lead author Margaret Quaid, MS, and researcher Jackie Goodrich, Ph.D., from the University of Michigan, who led the analysis on the methylation of genes.

They found that experienced firefighters had different epigenetic modifications at chromosome 8q24—a particular area of the genome

where epigenetic modifications have been linked to prostate cancer risk—compared with new firefighters.

One class of chemicals that is linked with epigenetic modifications is per- and polyfluoroalkyl substances, or PFAS, which are used in firefighting foam as well as in many [household items](#), including nonstick pans and water-resistant clothing. The research team also investigated whether there was a link between exposure to PFAS and epigenetic modification.

The results showed that, in many fire departments, new and experienced firefighters had similar exposure to PFAS. However, exposure to a specific PFAS chemical—branched perfluorooctanoic acid, or PFOA—was linked to epigenetic modifications.

"This study demonstrates the power of the Fire Fighter Cancer Cohort Study to combine data across grants—in this case awards from the Federal Emergency Management Agency in 2014, 2015 and 2018—to more powerfully evaluate questions from the fire service, this time around exposures and increased prostate cancer risk," Burgess said.

Other co-authors from the Zuckerman College of Public Health include toxicologist Shawn Beitel, MSc, research program administrative officer of the Firefighter Health Collaborative Research Program, and Sally Littau, health research coordinator. John Gulotta and Darin Wallentine of the Tucson Fire Department also contributed.

The research team included members from the University of Miami, Rutgers University, the National Institute for Occupational Safety and Health at the Centers for Disease Control and Prevention, the Los Angeles County Fire Department, the Orange County Fire Authority, and the Fire Protection Research Foundation.

More information: Margaret Quaid et al, Firefighting, per- and polyfluoroalkyl substances, and DNA methylation of genes associated with prostate cancer risk, *Environmental and Molecular Mutagenesis* (2024). [DOI: 10.1002/em.22589](https://doi.org/10.1002/em.22589)

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