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ASSESSMENT OF POTENTIAL HEALTH RISKS OF PORTUGUESE WILDLAND FIREFIGHTERS' OCCUPATIONAL EXPOSURE: BIOMONITORING APPROACH

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Abstract

Introduction: Worldwide, forest fires are among the most common forms of natural disasters. In the closing years of the last century, there was an increase in the burned area in some parts of the globe, including Europe. Portugal has been particularly affected by large forest fires and mega-fires, which have been occurred mainly in the central and northern regions. The proximity of firefighters to fire exposes them to high levels of toxic compounds making this occupation one of the most dangerous and leading International Agency for Research on Cancer to classified occupational firefighting activity as possibly carcinogenic to humans. Up to date, the existing studies are mainly focused on environmental monitoring, existing limited information regarding biomonitoring assessments during real scenarios of wildland fires combat. This study aims to evaluate the impact of firefighting occupational exposure at molecular and cellular levels, considering personal exposure levels. Early-effect biomarkers (e.g., micronucleus, DNA strand breaks and oxidative DNA damage) will be analyzed in order to understand the mechanisms of action through which woodsmoke may impact firefighters' health, including the risk of cancer.

Methodology: This ongoing prospective longitudinal study will comprise three different stages, specifically pre-exposure, exposure, and post-exposure to fire season. Around 200 wildland northern Portuguese firefighters will be involved in this study. Characterization of the study population will be conducted via questionnaires. Firefighters' personal exposure levels will be assessed by means of metabolites in exhaled breath, using an artificial olfactory system (e-nose technology). Buccal and urine samples will be used to measure genomic instability through a

micronucleus test in buccal epithelial cells and urothelial cells. DNA damage and oxidative DNA damage will be evaluated in peripheral blood lymphocytes using the comet assay. Statistical analysis will be performed to determine the relationship between personal exposure levels to toxic compounds and the early-effect biomarkers over the three different phases of the study.

Expected results: The obtained results will support a more accurate and comprehensive assessment of occupational risks among wildland firefighters, crucial to prevent/reduce the associated health impacts. This work will contribute to the establishment of recommendations/good practices to improve firefighters' working conditions, allowing better definitions of policies and prevention strategies highly needed in this sector.

Keywords: Biomonitoring; Occupational; Air pollution; Biomarkers; Wildland firefighter.