



STABILITY OF WIPE SAMPLING FOR POLYCYCLIC AROMATIC HYDROCARBONS FROM FIREFIGHTER'S SKIN AND CLOTHING



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BACKGROUND

Once firefighters remove their personal protective equipment (PPE), contact with contaminants occurs through dermal and inhalation exposure. The level of dermal exposure will depend on the storage and handling of contaminated PPE and will vary over time and between individuals.

STUDY OBJECTIVES

Fire effluents, deposited on the skin, can be picked up by wipe sampling and then analysed. The objective of this study was to optimise the wipe sampling method and to replicate shipping/ transportation from fire stations across the UK to the laboratory in order to identify the most suitable storage for collected samples.

METHODS

Skin wipe samples were taken with wipes cut to the size of 10x11cm and impregnated with 2.0 mL isopropyl alcohol. Each wipe was sealed in an airtight amber glass vial, wrapped in aluminium foil and stored in a polystyrene box at either ambient temperature or refrigerated with ice packs then tested at 24h intervals.

The wipes were ultrasonically extracted with 3ml of 3:1 hexane/acetone, centrifuged at 13K RPM and analysed via GCMS using an Agilent 6890 GC coupled to a 5973 MSD and a TraceGOLD TG-5MS column. The GC was set to a start temperature of 40°C with a 2 minute hold, then with 8°C/min to 210°C, with 2°C/min to 280°C and was held at 280°C for 3 minutes. The results were processed using MSD Chemstation F.01.00.1903. Each test was conducted in triplicate, and the values presented here are the averages from the three runs.

RESULTS

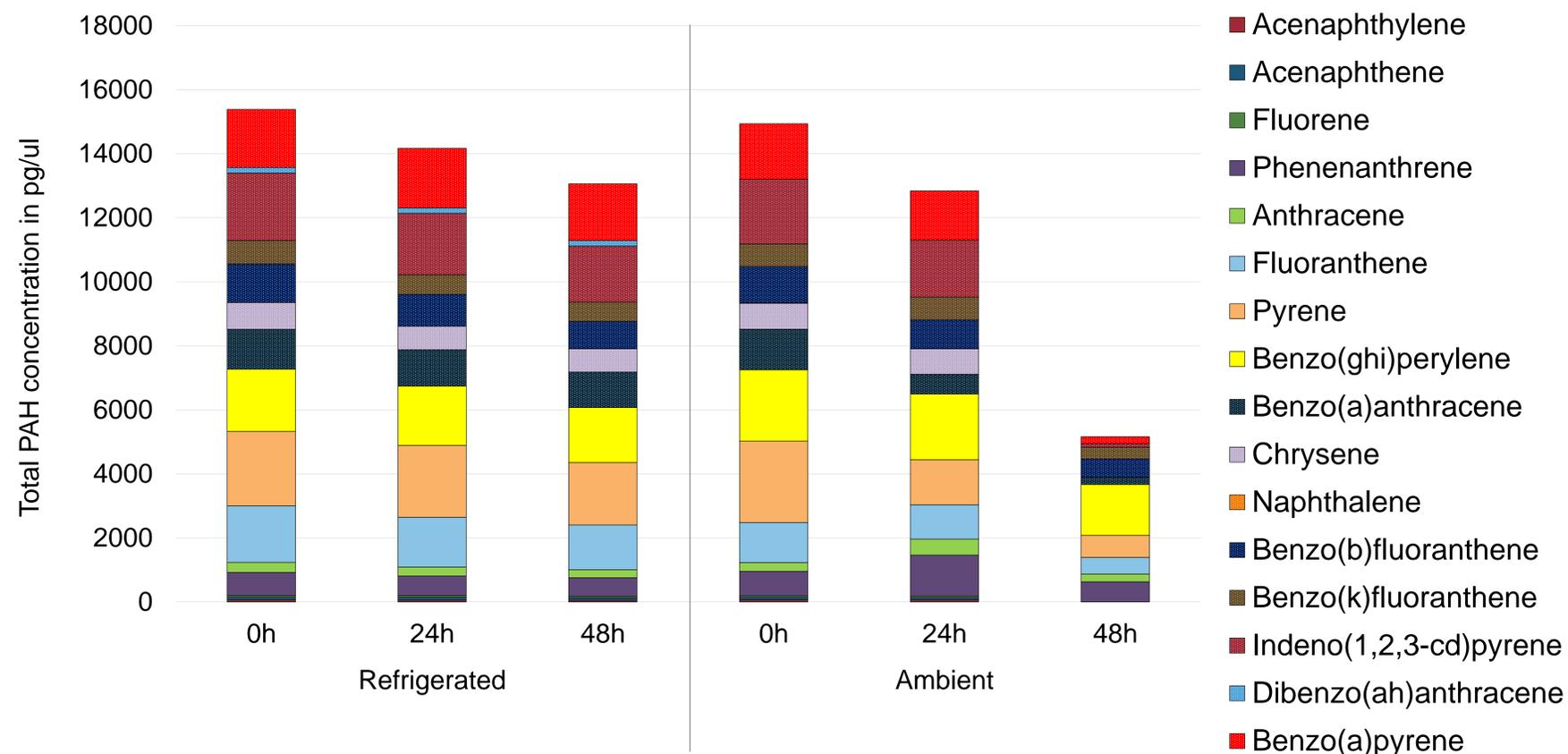


Figure 1. Total PAH concentrations from wipes kept in ambient and refrigerated conditions over a 48 hour period

- Under both conditions, wipe samples were stable at the 24 hour mark.
- The ambient condition samples showed a marked drop off at 48 hours, while the refrigerated wipes remained relatively stable.
- After 24 hours, naphthalene could not be identified in either sample.
- After 48 hours, acenaphthylene, acenaphthene, fluorene and chrysene could not be identified from the ambient sample.

CONCLUSIONS

- Storing the samples in air-tight refrigerated conditions is essential for sample stability during transportation.
- Research is continuing into the longer-term stability when refrigerated and into other methods which may provide greater stability.

REFERENCES

(1) Stec, A. A., Dickens, K. E., Salden, M., Hewitt, F. E., Watts, D. P., Houldsworth, P. E., & Martin, F. L. (2018). Occupational Exposure to Polycyclic Aromatic Hydrocarbons and Elevated Cancer Incidence in Firefighters. Scientific reports, 8(1), 2476. doi:10.1038/s41598-018-20616-6