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Efficacy of plasma and blood donation on serum per- and poly-fluoroalkyl substances (PFAS) concentrations in firefighters: An open label randomised controlled trial

Robin Gasiorowski[1,3], Miriam K. Forbes[1], Gabriel Silver[1], Yordanka Krastev[1], Brenton Hamdorf[1], Barry Lewis[2], Michael Tisbury[2], Merrole Cole-Sinclair[4] , Bruce P. Lanphear[5], Roger A. Klein[6] , Nigel Holmes[7] and Mark Patrick Taylor[1]

[1]Macquarie University, NSW, Australia; [2]Fire Rescue Victoria (FRV), Victoria, Australia; [3]Department of Haematology, Concord Repatriation General Hospital, NSW, Australia; [4]Laboratory Haematology Department, St Vincent's Hospital, Melbourne, Victoria, Australia; [5]Faculty of Health Sciences, Simon Fraser University, Vancouver, British Columbia, Canada; [6]Cambridge, UK and Christian Regenhard Center for Emergency Response Studies (RaCERS) CUNY New York, [7]Queensland Department of Environment and Science (DES), Queensland Australia

Summary

Objective: To systematically quantify whether plasma or blood removal are effective strategies for reducing serum PFAS concentrations.

Design and Setting: An open label randomised controlled trial in Fire and Rescue Victoria staff.

Participants: Current or former FRV staff or contractors, with serum PFOS ≥ 5 ng/mL; eligible to donate blood; had not donated blood in the 3 months prior to randomisation; able and willing to provide written informed consent.

Interventions: 285 firefighters with baseline serum perfluorooctane sulfonate (PFOS) > 5 ng/mL were randomly assigned to 12 months of 6 weekly plasma donation, 12 weekly blood donation or observation.

Main outcome measures: The co-primary endpoints were a change in serum PFOS and PFHxS concentrations after 12 months of plasma or blood donation, compared to baseline levels and the observation group.
Secondary endpoints included changes in serum PFAS (PFOS or PFHxS) levels in each group from week 52 to week 64; in serum levels of 26 other PFAS chemicals from baseline to week 52 and from week 52 to 64; and in full blood count, biochemistry, thyroid function, and lipid profile from screening to week 52.

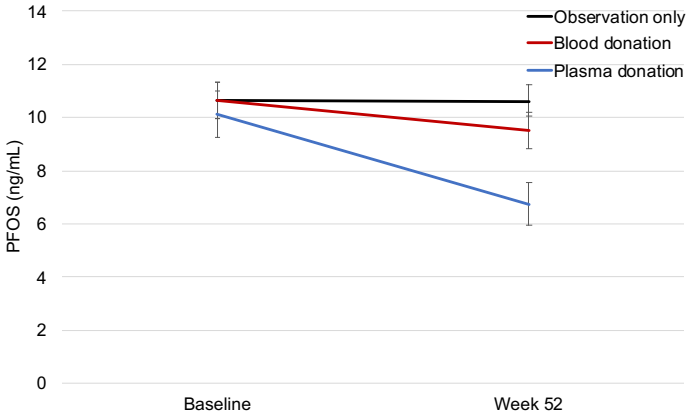
Results: A total of 285 firefighters were enrolled; 95 were assigned to plasma donation group, 95 to the blood donation group and 95 to the observation group.
PFOS at 12 months was significantly reduced in the plasma donation group (2·9 ng/mL, 95% CI 2·30–3·57, p <0.001) and blood donation group (1·1 ng/mL, 95% CI 0.70–1·53, p < 0.001), but they were unchanged in the observation group.
PFHxS was significantly reduced with plasma donation (1·1 ng/mL, 95% CI 0.70–1·59, p < 0.001), but there was no significant change in the blood donation or observation only groups. Analysis between groups indicated that plasma donation had a larger treatment effect than blood donation, but both were significantly more efficacious than observation.

Conclusions: Plasma and blood donation caused greater reductions in serum PFAS concentrations than observation alone over a 12-month period. Further research is needed to evaluate the clinical implications of these findings.

Trial registration: Australian New Zealand Clinical Trials Registry: ACTRN12619000204145

Co-Primary Endpoint Key Results

Co-primary endpoint 1 – PFOS week 52



Whole blood and plasma donation both reduced serum PFOS levels faster than the natural clearance rates of MFB/FRV staff in the observation-only group.

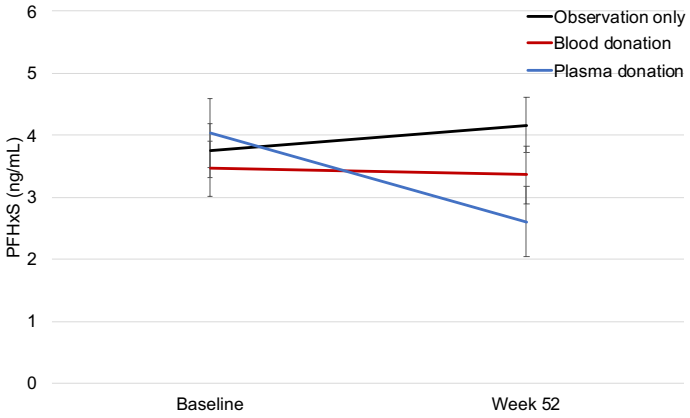
Blood donation reduced PFOS 1.1ng/mL more than observation, p < .001

Plasma donation reduced PFOS 3.1ng/mL more than observation, p < .001

Within each group, the average levels of PFOS changed as follows:

- **Observation 0.1% drop** (ns)
- **Blood donation 10.6% drop**, p < .001
- **Plasma donation 30.1% drop**, p < .001

Co-primary endpoint 2 – PFHxS week 52



Whole blood and plasma donation both reduced serum PFHxS levels faster than the natural clearance rates of MFB/FRV staff in the observation-only group.

Blood donation reduced PFHxS 0.6ng/mL more than observation, p = .001

Plasma donation reduced PFHxS 1.5ng/mL more than observation, p < .001

Within each group, the average levels of PFHxS changed as follows:

- **Observation 10.2% rise,** p = 0.059
- **Blood donation 3.0% drop**, p = 0.54
- **Plasma donation 30.0% drop**, p < .001