Icahn School of Medicine at Mount Sinai

HHEAR Data Center
Department of Environmental Medicine and Public Health

One Gustave L. Levy Place
Box 1057/1058
New York, NY 10029-6574

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From HHEAR Data Center
Subject HHEAR Project #2020-00605– Study data for per-and polyfluoroalkyl substances (SPFAS) in plasma heparin
To Noyan Gokce, MD

The per-and polyfluoroalkyl substances (SPFAS) in plasma data (N=146) analyzed by the Mount Sinai Untargeted Analysis Laboratory Hub for HHEAR project #2020-00605 is now finalized and available on the HHEAR Data Submission and Review Portal (DSRP). Biomarkers in this dataset include perfluorooctanoic acid total (PFOA), perfluorohexane sulfonate (PFHXS), perluoroheptanoic acid (PFHPA), perfluoroheptane-sulfonic acid (PFHPS), perfluorodecanoic acid (PFDA), as per the lab analysis plan.

The limit of detection (LOD) values reported were the average of the daily LODs for the whole study. The daily LODs were used to identify the valid values for each sample. Machine-read values were provided for all measurements. Negative values arise legitimately near the LOD, which is by definition +/- 33% of the 'blank' level. The following approaches can be considered for utilizing biomarker values below the LOD:

- Use the machine values.
- Substitute a surrogate value for all values <=LOD, which is often LOD/sqrt2, first recommended by Hornung and used by CDC [1].
- Use a multiple imputation method [2]. In general, a surrogate value is not used in models with continuous variables unless >60% of the observations are >LOD, as described in Lubin.

Twelve samples each of HHEAR untargeted serum pools 1 and 2 were run across batches, 4 per batch. The lab also included 2 NIST SRM 1950 samples, run across two of the three batches.

These laboratory results have been reviewed and approved by Brismar Pinto-Pacheco, PhD, Senior Scientist (brismar.pinto-pacheco@mssm.edu) at the Mount Sinai Untargeted Analysis Laboratory Hub to assure that they conform to acceptable quality standards[3]. Summary tables of the study sample data and relevant quality control data are appended at the end of this document.

Signed,

Moira Bixby,
Statistical Analyst

Susan Teitelbaum, Ph.D.
Principal Investigator, HHEAR Center for Data Science, Mount Sinai

REPORT OF LAB RESULTS

1 - Summary Table of Sample Data:

Geometric mean and geometric standard deviation, along with the percentile distribution, calculated for study samples with detectable levels (NC- not calculated when detection frequency was less than 70%).

Analyte	Number of Samples Analyzed	Number of Samples >LOD	Percent Detect	LOD	Geometric Mean	Geometric Mean STD	Min	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile	Max
PFDA (ng/mL)	146	143	98%	0.10	0.31	1.6	<LOD	0.16	0.21	0.30	0.41	0.51	1.0
PFHPA (ng/mL)	146	14	10%	0.10	NC	NC	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	0.32
PFHPS (ng/mL)	146	104	71%	0.10	0.20	1.6	<LOD	<LOD	<LOD	0.15	0.22	0.34	0.70
PFHXS (ng/mL)	146	106	73%	0.10	0.66	2.6	<LOD	<LOD	<LOD	0.41	0.94	1.7	31
PFOA (ng/mL)	146	146	100%	0.10	1.0	2.4	0.12	0.37	0.73	1.3	2.1	3.5	7.1

2 - Summary Table of HHEAR QC Pools:

A) HHEAR QC Pools Summary Table (Overall) – Twelve samples each of HHEAR QC Serum Pools P1_20 and P2_50 were run, 4 each across the 3 batches. Overall means and coefficients of variation were calculated for each pool. Note that results near the LOD are subject to greater uncertainty. *NC- not calculated*

Analyte	Pool	LOD	Total N	Valid N	% Valid	Mean	CV (%)
PFDA (ng/mL)	**Untargeted P1_20**	0.10	12	12	100	0.17	28
	Untargeted P2_50	0.10	12	12	100	0.24	18
PFHPS (ng/mL)	**Untargeted P1_20**	0.10	12	3	25	0.11	5
	Untargeted P2_50	0.10	12	12	100	0.14	7
PFHXS (ng/mL)	**Untargeted P1_20**	0.10	12	12	100	0.55	18
	Untargeted P2_50	0.10	12	12	100	0.92	12
PFOA (ng/mL)	**Untargeted P1_20**	0.10	12	12	100	0.55	16
	Untargeted P2_50	0.10	12	12	100	0.90	13

3- Recovery Table for NIST QC:

Two samples of NIST SRM 1950 were run, 1 each in 2 batches. NIST provides certified or reference values for NIST SRM 1950 for a subset of the SPFAS run in this analysis, referred to as target values in table. Recovery percentages* were calculated for analytes with available target values. Note that results near the LOD are subject to greater uncertainty. *NA – target value not available ; NC - not calculated.*

Analyte	Pool	Target value	LOD	Total N	Valid N	% Valid	Mean	CV (%)	Mean Recovery (%)
PFDA (ng/mL)	**SRM1950**	0.322	0.10	2	2	100	0.42	39	129
PFHPA (ng/mL)	**SRM1950**	NA	0.10	2	2	100	0.16	9	NC
PFHPS (ng/mL)	**SRM1950**	NA	0.10	2	2	100	0.37	4	NC
PFHXS (ng/mL)	**SRM1950**	3.25	0.10	2	2	100	3.3	3	103
PFOA (ng/mL)	**SRM1950**	3.27	0.10	2	2	100	3.4	3	103

$$^{*}\%\ Recovery = \frac{sample\ result}{NIST\ reference\ or\ certified\ value} * 100$$

References:

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3. Kannan, K., et al., *Quality assurance and harmonization for targeted biomonitoring measurements of environmental organic chemicals across the Children's Health Exposure Analysis Resource laboratory network.* International Journal of Hygiene and Environmental Health, 2021. 234: p. 113741.
4. Protection, N.J.D.o.E., *Data Quality Assessment and Data Usability Evaluation Technical Guidance.* 2014(Version 1.0): p. 1-132.
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6. McGraw, K.O. and S.P. Wong, *Forming inferences about some intraclass correlation coefficients.* Psychological methods, 1996. 1(1): p. 30.
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