**Supplementary Material**

**Paternal Urinary Concentrations of Organophosphate Flame Retardant Metabolites, Fertility Measures, and Pregnancy Outcomes among Couples Undergoing *in Vitro* Fertilization**

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**Table S1.** Distribution of urinary organophosphate flame retardant metabolites (ug/L) in 498 urines collected from 201 women undergoing 276 IVF cycles in the EARTH Study.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **N > MDL** | **GM (95% CI)** | **Min** | **10th Pctl** | **25th Pctl** | **50th Pctl** | **75th Pctl** | **90th Pctl** | **95th Pctl** | **Max** |
| **(%)** |
| **Specific Gravity Adjusteda** |  |  |  |  |  |  |  |  |
| BCIPP | 0 (0.0) | NA | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL |
| BDCIPP | 431 (87) | 0.70 (0.63, 0.78) | <MDL | <MDL | 0.33 | 0.69 | 1.47 | 3.34 | 5.27 | 63.41 |
| DPHP | 467 (94) | 0.84 (0.77, 0.91) | <MDL | 0.29 | 0.42 | 0.76 | 1.30 | 3.19 | 5.35 | 198.12 |
| ip-PPP | 395 (79) | 0.24 (0.22, 0.26) | <MDL | <MDL | 0.12 | 0.24 | 0.45 | 0.80 | 1.21 | 51.87 |
| tb-PPP | 64 (13) | NA | <MDL | <MDL | <MDL | <MDL | <MDL | 0.27 | 0.38 | 2.58 |
| **Wet weight (unadjusted)** |   |   |   |   |   |   |   |   |
| BCIPP | 0 (0.0) | NA | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL | <MDL |
| BDCIPP | 431 (87) | 0.67 (0.60, 0.76) | <MDL | <MDL | 0.29 | 0.70 | 1.74 | 3.80 | 6.37 | 63.41 |
| DPHP | 467 (94) | 0.80 (0.72, 0.89) | <MDL | 0.18 | 0.41 | 0.80 | 1.55 | 3.56 | 6.68 | 330.20 |
| ip-PPP | 395 (79) | 0.23 (0.20, 0.25) | <MDL | <MDL | 0.09 | 0.24 | 0.50 | 0.97 | 1.48 | 79.54 |
| tb-PPP | 64 (13) | NA | <MDL | <MDL | <MDL | <MDL | <MDL | 0.11 | 0.24 | 4.99 |

aAdjusted to specific gravity, range (1.001-1.035)

Abbreviations: < MDL, method detection limit; Max, maximum; Pctl: percentile; Min, minimum. All values below MDL were assigned a value equal to the MDL divided by √2

**Table S2a.** Unadjusted and adjusted means (95% CI) for early developmental outcomes by quartile of urinary organophosphate flame retardant metabolite concentrations among 195 men with partners undergoing 263 IVF cycles that had oocyte retrieval.

|  |  |  |  |
| --- | --- | --- | --- |
|   | ΣPFR |   | BDCIPP |
|   | Unadjusted | Model1a | Model2b |   | Unadjusted | Model1a | Model2b |
| Fertilization, proportion |   |   |   |   |   |   |
| Q1 | 0.76 (0.71, 0.80) | 0.76 (0.71, 0.80) | 0.75 (0.70, 0.79) |  | 0.78 (0.74, 0.82) | 0.78 (0.74, 0.82) | 0.78 (0.73, 0.83) |
| Q2 | 0.68 (0.63, 0.73)\* | 0.68 (0.63, 0.73)\* | 0.67 (0.62, 0.72)\* |  | 0.71 (0.65, 0.75)\* | 0.71 (0.65, 0.75)\* | 0.71 (0.65, 0.75)\* |
| Q3 | 0.70 (0.65, 0.75) | 0.70 (0.65, 0.75) | 0.71 (0.66, 0.76) |  | 0.67 (0.62, 0.72)\* | 0.67 (0.62, 0.72)\* | 0.67 (0.61, 0.72)\* |
| Q4 | 0.74 (0.69, 0.78) | 0.74 (0.69, 0.78) | 0.75 (0.70, 0.79) |  | 0.72 (0.67, 0.77) | 0.72 (0.67, 0.77)\* | 0.72 (0.66, 0.77) |
| p-trend | 0.58 | 0.67 | 0.69 |  | 0.03 | 0.03 | 0.06 |
| Best quality embryos, count |   |   |   |   |   |   |
| Q1 | 1.6 (1.2, 2.1) | 1.6 (1.2, 2.1) | 1.6 (1.2, 2.1) |  | 1.8 (1.3, 2.3) | 1.8 (1.3, 2.4) | 1.9 (1.4, 2.5) |
| Q2 | 1.1 (0.8, 1.5)\* | 1.1 (0.8, 1.5)\* | 1.1 (0.8, 1.5) |  | 1.3 (1.0, 1.8) | 1.3 (1.0, 1.8) | 1.4 (1.0, 1.8) |
| Q3 | 1.4 (1.0, 1.8) | 1.4 (1.0, 1.9) | 1.4 (1.0, 1.8) |  | 1.1 (0.8, 1.5)\* | 1.1 (0.8, 1.5)\* | 1.0 (0.8, 1.4)\* |
| Q4 | 2.0 (1.5, 2.5) | 1.9 (1.5, 2.5) | 1.9 (1.4, 2.4) |  | 1.8 (1.4, 2.4) | 1.8 (1.3, 2.4) | 1.6 (1.2, 2.2) |
| p-trend | 0.15 | 0.18 | 0.25 |  | 0.94 | 0.80 | 0.37 |

aControls for year of IVF treatment cycle (continuous) and primary SART infertility diagnosis at study entry (female, male, unknown) as well as paternal age (continuous), body mass index (continuous) and race/ethnicity (black/Asian/other, white/Caucasian).

bControls for the variables in the adjusted model as well as maternal urinary PFR metabolite (continuous), age (continuous), body mass index (continuous) and race/ethnicity (black/Asian/other, white/Caucasian).

Adjusted means are presented for the mean year of IVF treatment cycle (2010), primary SART infertility diagnosis at study entry (female=1, male=0, unexplained=0) as well as mean paternal age (36.9), body mass index (27.1), and race/ethnicity (white); and maternal age (35.1), body mass index (23.9), and race/ethnicity (white).

\*Significantly different from Q1 at the p=0.05 level

**Table S2b.** Unadjusted and adjusted means (95% CI) for early developmental outcomes by quartile of urinary organophosphate flame retardant metabolite concentrations among 195 men with partners undergoing 263 IVF cycles that had oocyte retrieval.

|  |  |  |  |
| --- | --- | --- | --- |
|   | DPHP |   | ip-PPP |
|   | Unadjusted | Model1a | Model2b |   | Unadjusted | Model1a | Model2b |
| Fertilization, proportion |   |   |   |   |   |   |
| Q1 | 0.74 (0.70, 0.79) | 0.74 (0.69, 0.79) | 0.73 (0.68, 0.78) |  | 0.76 (0.72, 0.80) | 0.76 (0.72, 0.80) | 0.75 (0.71, 0.80) |
| Q2 | 0.68 (0.63, 0.73) | 0.69 (0.63, 0.73) | 0.69 (0.63, 0.73) |  | 0.69 (0.64, 0.74)\* | 0.69 (0.64, 0.74)\* | 0.70 (0.65, 0.75) |
| Q3 | 0.74 (0.69, 0.78) | 0.73 (0.68, 0.78) | 0.73 (0.68, 0.78) |  | 0.71 (0.66, 0.75) | 0.71 (0.65, 0.75) | 0.70 (0.65, 0.75) |
| Q4 | 0.71 (0.67, 0.76) | 0.72 (0.67, 0.76) | 0.72 (0.67, 0.77) |  | 0.72 (0.67, 0.76) | 0.72 (0.67, 0.76) | 0.73 (0.68, 0.77) |
| p-trend | 0.65 | 0.76 | 0.85 |  | 0.21 | 0.19 | 0.41 |
| Best quality embryos, count |   |   |   |   |   |   |
| Q1 | 1.5 (1.1, 1.9) | 1.4 (1.1, 1.9) | 1.5 (1.1, 1.9) |  | 1.7 (1.3, 2.2) | 1.7 (1.3, 2.2) | 1.6 (1.2, 2.1) |
| Q2 | 1.2 (0.9, 1.6) | 1.2 (0.9, 1.6) | 1.1 (0.8, 1.5) |  | 1.4 (1.0, 1.8) | 1.4 (1.0, 1.8) | 1.3 (1.0, 1.8) |
| Q3 | 1.6 (1.2, 2.0) | 1.6 (1.2, 2.1) | 1.5 (1.2, 2.0) |  | 1.4 (1.0, 1.8) | 1.4 (1.0, 1.8) | 1.3 (1.0, 1.8) |
| Q4 | 1.8 (1.4, 2.3) | 1.8 (1.4, 2.3) | 1.8 (1.3, 2.3) |  | 1.5 (1.2, 2.0) | 1.5 (1.2, 2.1) | 1.6 (1.2, 2.1) |
| p-trend | 0.10 | 0.11 | 0.15 |  | 0.57 | 0.64 | 0.91 |

aControls for year of IVF treatment cycle (continuous) and primary SART infertility diagnosis at study entry (female, male, unknown) as well as paternal age (continuous), body mass index (continuous) and race/ethnicity (black/Asian/other, white/Caucasian).

bControls for the variables in the adjusted model as well as maternal urinary PFR metabolite (continuous), age (continuous), body mass index (continuous) and race/ethnicity (black/Asian/other, white/Caucasian).

Adjusted means are presented for the mean year of IVF treatment cycle (2010), primary SART infertility diagnosis at study entry (female=1, male=0, unexplained=0) as well as mean paternal age (36.9), body mass index (27.1), and race/ethnicity (white); and maternal age (35.1), body mass index (23.9), and race/ethnicity (white).

p-trend calculated using median of ln-transformed urinary metabolite concentrations.

\*Significantly different from Q1 at the p=0.05 level

**Table S3a.** Unadjusted and adjusted mean (95% CI) proportion of cycles resulting in implantation, live birth and clinical pregnancy by quartile of urinary organophosphate flame retardant metabolite concentrations among 201 men with partners undergoing 276 IVF cycles.

|  |  |  |  |
| --- | --- | --- | --- |
|   | ΣPFR |   | BDCIPP |
|   | Unadjusted | Model1a | Model2b |   | Unadjusted | Model1a | Model2b |
| Implantation  |   |   |   |   |   |   |   |
| Q1 | 0.65 (0.53, 0.76) | 0.65 (0.52, 0.76) | 0.63 (0.49, 0.75) |  | 0.60 (0.47, 0.71) | 0.59 (0.46, 0.71) | 0.55 (0.40, 0.69) |
| Q2 | 0.55 (0.42, 0.67) | 0.56 (0.42, 0.68) | 0.54 (0.40, 0.67) |  | 0.63 (0.50, 0.74) | 0.64 (0.51, 0.75) | 0.63 (0.49, 0.75) |
| Q3 | 0.58 (0.45, 0.70) | 0.61 (0.47, 0.73) | 0.62 (0.48, 0.74) |  | 0.55 (0.42, 0.67) | 0.56 (0.43, 0.69) | 0.58 (0.44, 0.70) |
| Q4 | 0.61 (0.48, 0.72) | 0.60 (0.47, 0.72) | 0.65 (0.51, 0.76) |  | 0.61 (0.48, 0.73) | 0.62 (0.49, 0.74) | 0.68 (0.53, 0.80) |
| p-trend | 0.77 | 0.80 | 0.65 |  | 0.99 | 0.90 | 0.29 |
| Pregnancy  |   |   |   |   |   |   |   |
| Q1 | 0.59 (0.47, 0.70) | 0.58 (0.45, 0.70) | 0.55 (0.41, 0.68) |  | 0.52 (0.39, 0.64) | 0.51 (0.38, 0.64) | 0.47 (0.33, 0.61) |
| Q2 | 0.47 (0.35, 0.59) | 0.48 (0.35, 0.60) | 0.46 (0.33, 0.59) |  | 0.53 (0.41, 0.65) | 0.53 (0.40, 0.66) | 0.52 (0.38, 0.64) |
| Q3 | 0.46 (0.34, 0.58) | 0.48 (0.35, 0.61) | 0.49 (0.35, 0.62) |  | 0.50 (0.38, 0.62) | 0.52 (0.39, 0.64) | 0.53 (0.39, 0.66) |
| Q4 | 0.54 (0.41, 0.66) | 0.53 (0.40, 0.65) | 0.57 (0.44, 0.70) |  | 0.51 (0.39, 0.63) | 0.51 (0.38, 0.63) | 0.56 (0.42, 0.69) |
| p-trend | 0.61 | 0.67 | 0.68 |  | 0.88 | 0.95 | 0.40 |
| Live birth  |   |   |   |   |   |   |   |
| Q1 | 0.52 (0.40, 0.64) | 0.49 (0.36, 0.62) | 0.47 (0.33, 0.61) |  | 0.46 (0.34, 0.59) | 0.43 (0.30, 0.56) | 0.41 (0.28, 0.56) |
| Q2 | 0.34 (0.23, 0.47)\* | 0.34 (0.23, 0.47) | 0.33 (0.22, 0.46) |  | 0.43 (0.31, 0.55) | 0.42 (0.30, 0.55) | 0.41 (0.29, 0.55) |
| Q3 | 0.33 (0.22, 0.45)\* | 0.35 (0.23, 0.49) | 0.34 (0.23, 0.48) |  | 0.36 (0.25, 0.48) | 0.36 (0.25, 0.50) | 0.35 (0.24, 0.49) |
| Q4 | 0.44 (0.32, 0.56) | 0.42 (0.30, 0.55) | 0.45 (0.32, 0.58) |  | 0.38 (0.27, 0.51) | 0.39 (0.27, 0.52) | 0.41 (0.27, 0.56) |
| p-trend  | 0.42 | 0.58 | 0.98 |   | 0.29 | 0.59 | 0.86 |

aControls for year of IVF treatment cycle (continuous) and primary SART infertility diagnosis at study entry (female, male, unknown) as well as paternal age (continuous), body mass index (continuous) and race/ethnicity (black/Asian/other, white/Caucasian).

bControls for the variables in the adjusted model as well as maternal urinary PFR metabolite (continuous), age (continuous), body mass index (continuous) and race/ethnicity (black/Asian/other, white/Caucasian).

Adjusted means are presented for the mean year of IVF treatment cycle (2010), primary SART infertility diagnosis at study entry (female=1, male=0, unexplained=0) as well as mean paternal age (36.9), body mass index (27.1), and race/ethnicity (white); and maternal age (35.1), body mass index (23.8), and race/ethnicity (white).

p-trend calculated using median of ln-transformed urinary metabolite concentrations.

\*Significantly different from Q1 at the p=0.05 level

**Table S3b.** Unadjusted and adjusted mean (95% CI) proportion of cycles resulting in implantation, live birth and clinical pregnancy by quartile of urinary organophosphate flame retardant metabolite concentrations among 201 men with partners undergoing 276 IVF cycles.

|  |  |  |  |
| --- | --- | --- | --- |
|   | DPHP |   | ip-PPP |
|   | Unadjusted | Model1a | Model2b |   | Unadjusted | Model1a | Model2b |
| Implantation  |   |   |   |   |   |   |   |
| Q1 | 0.67 (0.55, 0.78) | 0.68 (0.55, 0.79) | 0.65 (0.51, 0.77) |  | 0.58 (0.45, 0.70) | 0.58 (0.45, 0.71) | 0.59 (0.45, 0.72) |
| Q2 | 0.52 (0.40, 0.64) | 0.53 (0.40, 0.66) | 0.54 (0.40, 0.67) |  | 0.50 (0.38, 0.63) | 0.50 (0.37, 0.63) | 0.50 (0.37, 0.64) |
| Q3 | 0.63 (0.51, 0.74) | 0.64 (0.51, 0.75) | 0.65 (0.51, 0.76) |  | 0.69 (0.57, 0.79) | 0.70 (0.57, 0.81) | 0.71 (0.58, 0.82) |
| Q4 | 0.56 (0.43, 0.68) | 0.56 (0.43, 0.69) | 0.60 (0.46, 0.73) |  | 0.62 (0.49, 0.73) | 0.63 (0.49, 0.74) | 0.63 (0.49, 0.75) |
| p-trend | 0.34 | 0.35 | 0.86 |  | 0.31 | 0.30 | 0.32 |
| Pregnancy  |   |   |   |   |   |   |   |
| Q1 | 0.58 (0.46, 0.70) | 0.58 (0.45, 0.70) | 0.54 (0.41, 0.67) |  | 0.53 (0.41, 0.65) | 0.52 (0.39, 0.65) | 0.52 (0.39, 0.65) |
| Q2 | 0.46 (0.34, 0.58) | 0.47 (0.34, 0.59) | 0.46 (0.34, 0.59) |  | 0.44 (0.32, 0.56) | 0.44 (0.32, 0.57) | 0.44 (0.32, 0.57) |
| Q3 | 0.53 (0.40, 0.65) | 0.53 (0.40, 0.65) | 0.53 (0.40, 0.66) |  | 0.56 (0.43, 0.67) | 0.57 (0.44, 0.69) | 0.57 (0.44, 0.69) |
| Q4 | 0.48 (0.36, 0.60) | 0.49 (0.36, 0.61) | 0.54 (0.40, 0.67) |  | 0.53 (0.41, 0.65) | 0.54 (0.41, 0.66) | 0.54 (0.40, 0.66) |
| p-trend | 0.36 | 0.42 | 0.90 |  | 0.75 | 0.59 | 0.62 |
| Live birth  |   |   |   |   |   |   |   |
| Q1 | 0.43 (0.31, 0.55) | 0.42 (0.30, 0.55) | 0.38 (0.25, 0.52) |  | 0.48 (0.36, 0.61) | 0.47 (0.35, 0.61) | 0.45 (0.32, 0.59) |
| Q2 | 0.36 (0.25, 0.48) | 0.36 (0.24, 0.49) | 0.35 (0.24, 0.49) |  | 0.27 (0.17, 0.39)\* | 0.26 (0.16, 0.39)\* | 0.26 (0.16, 0.39)\* |
| Q3 | 0.43 (0.31, 0.55) | 0.41 (0.29, 0.54) | 0.40 (0.28, 0.54) |  | 0.46 (0.34, 0.59) | 0.45 (0.33, 0.59) | 0.45 (0.32, 0.59) |
| Q4 | 0.41 (0.29, 0.54) | 0.41 (0.29, 0.54) | 0.44 (0.31, 0.58) |  | 0.41 (0.30, 0.54) | 0.41 (0.29, 0.55) | 0.41 (0.28, 0.55) |
| p-trend  | 1.00 | 0.92 | 0.43 |   | 0.77 | 0.87 | 0.94 |

aControls for year of IVF treatment cycle (continuous) and primary SART infertility diagnosis at study entry (female, male, unknown) as well as paternal age (continuous), body mass index (continuous) and race/ethnicity (black/Asian/other, white/Caucasian).

bControls for the variables in the adjusted model as well as maternal urinary PFR metabolite (continuous), age (continuous), body mass index (continuous) and race/ethnicity (black/Asian/other, white/Caucasian).

Adjusted means are presented for the mean year of IVF treatment cycle (2010), primary SART infertility diagnosis at study entry (female=1, male=0, unexplained=0) as well as mean paternal age (36.9), body mass index (27.1), and race/ethnicity (white); and maternal age (35.1), body mass index (23.8), and race/ethnicity (white).

p-trend calculated using median of ln-transformed urinary metabolite concentrations.

\*Significantly different from Q1 at the p=0.05 level

**Table S4.** Comparison of GM (95% CI) concentrations of urinary organophosphate flame retardant metabolites (µg/L).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Region (sample size) | Gender | Year | BDCIPP | DPHP | ip-PPP | Reference |
| Massachusetts (n=29) | Both | 2009 | 0.41 (0.28-0.59) | 1.9 (1.2-3.0)b | NR | (Carignan et al. 2013) |
| United States (n=9) | Both | 2011 | 0.41 (NR) | 3.0 (NR) | NR | (Cooper et al. 2011) |
| California (n=14) | Both | 2011 | 0.09c (NR) | 0.44c (NR) | NR | (Dodson et al. 2014) |
| North Carolina (n=53) | Female | 2012 | 0.63 (0.49, 0.81)a | 1.7 (1.36, 2.18)a | NR | (Hoffman et al. 2015) |
| Norway (n=48)d | Female | 2012 | 0.12d (NR) | 0.51d (NR) | NR | (Cequier et al. 2015) |
| California (n=28) | Female | 2015 | 3.3 (2.5, 4.2) | 1.2 (0.97, 1.5) | 2.0 (1.5, 2.5) | (Butt et al. 2016) |
| China (n=23) | Female | 2015 | 1.2 (NR) | 1.1 (NR) | NR | (Feng et al. 2016) |
| California (n=310) | Female | 2000-2001 | 0.28 (0.23, 0.34)f | 0.93 (0.82, 1.06)f | 0.33 (0.30, 0.36)f | (Castorina et al. 2017) |
| North Carolina (n=349) | Female | 2002-2005 | 1.8 (NR) | 1.4 (NR) | 6.8 (NR) | (Hoffman et al. 2017) |
| Massachusetts (n=45) | Male | 2002-2007 | 0.13 (NR) | 0.31 (NR) | NR | (Meeker et al. 2013) |
| **Massachusetts (n=201)** | **Male** | **2005-2015** | **0.42 (0.36, 0.48)** | **0.60 (0.54, 0.66)** | **0.20 (0.18, 0.22)** | **This study** |
| Massachusetts (n=211) | Female | 2005-2015 | 0.70 (0.63, 0.77) | 0.81 (0.75, 0.89) | 0.24 (0.22, 0.26) | Carignan et al. *in review* |
| Massachusetts (n=51) | Both | 2010-2011 | NR | 1.80 to 2.99f | NR | (Preston et al. 2017) |
| Australia (n=3224, pooled)e | NR | 2010-2013 | 1.00, 0.66e | 24.4, 64.4e | NR | (Van den Eede et al. 2015) |
| New Jersey (n=22) | Female | 2013-2014 | 2.4 (1.5, 3.7) | 1.9 (1.1, 3.4) | 0.85 (0.67, 1.1) | (Butt et al. 2014) |
| Rhode Island (n=59) | Female | 2014-2015 | 1.18c | 0.93c | NR | (Romano et al. 2017) |

Normalized using a mean specific gravity of 1.024 unless otherwise indicated

NR=Not reported

aConfidence interval obtained from study authors, n=52 for TBBA

bPreviously unpublished data obtained from the authors

cNot SG normalized, median concentrations

dNormalized using a mean specific gravity of 1.015, 244 urine samples total

eNot SG normalized, GMs for two sampling campaigns (2010-2011 and 2012-2013)

fNormalized to specific gravity, mean specific gravity used not specified

**Table S5.** Spearman correlation of organophosphate and phthalate urinary metabolites.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | Acronym | BDCIPP | DPHP | ip-DPHP |
| Phenol metabolites |   |   |   |   |
| Bisphenol A  | BPA | 0.12 (0.04) | 0.32 (<0.0001) | 0.16 (0.005) |
| Bisphenol S  | BPS | -0.02 (0.88) | 0.14 (0.27) | 0.2 (0.12) |
| Benzophenone-3 | BP-3 | 0.09 (0.24) | 0.17 (0.02) | -0.02 (0.78) |
| Butyl paraben | B-PB | -0.08 (0.19) | 0.04 (0.48) | 0.14 (0.02) |
| Ethyl paraben | E-BP | 0.06 (0.65) | 0.12 (0.33) | 0.06 (0.63) |
| Methyl Paraben | M-PB | -0.01 (0.93) | 0.12 (0.06) | 0.06 (0.32) |
| Propyl Paraben | P-PB | -0.01 (0.85) | 0.14 (0.02) | 0.09 (0.15) |
| Triclocarban | TCC | -0.13 (0.32) | -0.07 (0.60) | 0.15 (0.25) |
| Triclosan  | TCS | 0.20 (0.01) | 0.08 (0.29) | 0.10 (0.18) |
| 24-Dichlorophenol | 24-DCP | 0.17 (0.02) | 0.16 (0.03) | 0.01 (0.94) |
| 25-Dichlorophenol | 25-DCP | 0 (0.99) | 0.20 (0.01) | 0.21 (0.005) |
|  | **Minimum** | -0.13 (0.32) | -0.07 (0.56) | -0.02 (0.78) |
|  | **Maximum** | 0.12 (0.01) | 0.32 (<0.0001) | 0.21 (0.005) |
| Phthalates |   |   |   |   |
| Cyclohexane-1 2-dicarboxylic acid monohydroxy isononyl ester | MHiNCH | 0.11 (0.30) | -0.18 (0.07) | 0.04 (0.72) |
| Mono-n-butyl phthalate | mBP | 0.17 (0.003) | 0.30 (<0.0001) | 0.11 (0.05) |
| Mono-isobutyl phthalate | miBP | 0.22 (<0.001) | 0.24 (<0.0001) | 0.02 (0.77) |
| Mono carboxyisononyl phthalate | mCNP | 0.07 (0.23) | 0.20 (<0.001) | 0 (0.99) |
| Mono carboxyisooctyl phthalate | mCOP | 0.21 (<0.001) | 0.16 (0.01) | -0.05 (0.40) |
| Mono-2-ethyl-5-carboxypentyl phthalate | mECPP | 0.12 (0.04) | 0.26 (<0.0001) | 0.2 (<0.001) |
| Mono-2-ethyl-5-hydroxyhexyl phthalate | mEHHP | 0.13 (0.03) | 0.28 (<0.0001) | 0.19 (0.009) |
| Mono-2-ethylhexyl phthalate | mEHP | 0.06 (0.31) | 0.27 (<0.0001) | 0.15 (0.01) |
| Mono-2-ethyl-5-oxohexyl phthalate  | mEOHP | 0.13 (0.02) | 0.28 (<0.0001) | 0.18 (0.002) |
| Mono-3-carboxypropyl phthalate | mCPP | 0.18 (0.002) | 0.21 (<0.001) | -0.04 (0.46) |
| Monoethyl phthalate | mEP1 | 0.05 (0.39) | 0.21 (<0.001) | 0.16 (0.01) |
| Monobenzyl phthalate | mBZP1 | 0.17 (0.004) | 0.33 (<0.0001) | 0.16 (0.01) |
| Cyclohexane-1 2-dicarboxylic acid monocarboxyisooctyl ester  | mCOCH | -0.06 (0.63) | -0.14 (0.27) | -0.01 (0.95) |
| Mono-hydroxybutyl phthalate | mHBP | 0.04 (0.78) | 0.13 (0.32) | 0.21 (0.10) |
| Mono-hydroxyisobutyl phthalate | mHiBP | 0 (1) | 0.28 (0.03) | 0.15 (0.23) |
| Mono-isononyl phthalate | mNP2 | 0.02 (0.86) | 0.17 (0.17) | 0.02 (0.90) |
| Monomethyl phthalate | mMP | -0.16 (0.20) | 0.03 (0.81) | 0.06 (0.65) |
|  | **Minimum** | -0.16 (0.20) | -0.18 (0.07) | -0.05 (0.40) |
|   | **Maximum** | 0.22 (<0.001) | 0.33 (<0.0001) | 0.21 (0.10) |

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