Novel Exposure Biomarkers of N,N-Diethyl-m-Toluamide (DEET): Data from the 2007–2010 National Health and Nutrition Examination Survey

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SUPPORTING INFORMATION

Table S1. Geometric mean and selected percentiles of N,N-diethyl-m-toluamide (DEET) concentrations in urine for the U.S. population 6 years of age and older: data from National Health and Nutrition Examination Survey 2007–2010a

|  | | | | **Geometric** | | | **Selected percentile** | | | | | | | | | | | | | | | | | **Sample** | |  | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Survey** | | | **mean** | | | ( 95% confidence interval) | | | | | | | | | | | | | | | | | **size** | |  | |
|  | **years** | | | (95% confidence limit) | | | **50th** | | | | **75th** | | | | | **90th** | | | | **95th** | | | |  | |  | |
| **Total** | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 2565 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 2744 | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| **Age group** |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| 6-11 years | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 380 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 386 | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| 12-19 years | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 386 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 400 | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| 20-59 years | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 1169 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 1307 | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| 60 years and older | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 630 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 651 | |  | |
| **Gender** |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| Males | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 1286 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 1343 | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| Females | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 1279 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 1401 | |  | |
| **Race/ethnicity** |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| Non-Hispanic whites | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 1071 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 1199 | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| Mexican Americans | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 499 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 600 | |  | |
|  |  | | |  |  | |  | |  | |  | |  | | |  |  | | |  |  | | |  | |  | |
| Non-Hispanic blacks | 07-08 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 570 | |  | |
|  | 09-10 | | | **\*** |  | | **< LOD** | |  | | **< LOD** | |  | | | **< LOD** |  | | | **< LOD** |  | | | 504 | |  | |
|  | |  |  | | |  | |  | |  | |  | |  |  | | |  |  | | |  |  | |  | |  | |  |

aConcentrations are given in µg/L. The 95% confidence intervals are shown in parentheses. Participants not defined by the three racial/ethnic groups shown were included only in the total population estimate. Limit of detection (LOD)=0.08 µg/L.

\* Not calculated: proportion of results below limit of detection was too high to provide a valid result.

Table S2. Observed statistical significance values for differences between adjusted GM concentrations of DCBA for various demographic groups.

Difference p-Value

Winter, 2007–2008 vs 2009–2010 0.38

Summer, 2007–2008 vs 2009–2010 0.027

2007–2008, Summer vs Winter 0.74

2009–2010, Summer vs Winter 0.017

<$20K, Summer vs Winter 0.294

$20–$45K, Summer vs Winter 0.059

$45–$75K, Summer vs Winter 0.003

>$75K, Summer vs Winter 0.017

Winter, <$20K vs $20–$45K 0.816

Winter, <$20K vs $45–$75K 0.012

Winter, <$20K vs >$75K 0.400

Winter, $20–$45K vs $45–$75K 0.022

Winter, $20–$45K vs >$75K 0.022

Winter, $45–$75K vs >$75K 0.369

Summer, <$20K vs $20–$45K 0.158

Summer, <$20K vs $45–$75K 0.20

Summer, <$20K vs >$75K 0.047

Summer, $20–$45K vs $45–$75K 0.631

Summer, $20–$45K vs >$75K 0.631

Summer, $45–$75K vs >$75K 0.32

Mexican American, 6–11 years vs 12–19 years 0.000

Mexican American, 6–11 years vs 20–59 years 0.000

Mexican American, 6–11 years vs 60+ years 0.042

Mexican American, 12–19 years vs 20–59 years 0.748

Mexican American, 12–19 years vs 60+ years 0.174

Mexican American, 20–59 years vs 60+ years 0.075

Non-Hispanic White, 6–11 years vs 12–19 years 0.286

Non-Hispanic White, 6–11 years vs 20–59 years 0.001

Non-Hispanic White, 6–11 years vs 60+ years 0.001

Non-Hispanic White, 12–19 years vs 20–59 years 0.000

Non-Hispanic White, 12–19 years vs 60+ years 0.000

Non-Hispanic White, 20–59 years vs 60+ years 0.198

Non-Hispanic Black, 6–11 years vs 12–19 years 0.451

Non-Hispanic Black, 6–11 years vs 20–59 years 0.001

Non-Hispanic Black, 6–11 years vs 60+ years 0.046

Non-Hispanic Black, 12–19 years vs 20–59 years 0.018

Non-Hispanic Black, 12–19 years vs 60+ years 0.242

Non-Hispanic Black, 20–59 years vs 60+ years 0.467

6-11 years, Mexican American vs Non-Hispanic White 0.103

6-11 years, Mexican American vs Non-Hispanic Black 0.438

6-11 years, Non-Hispanic White vs Non-Hispanic Black 0.006

12-19 years, Mexican American vs Non-Hispanic White 0.004

12-19 years, Mexican American vs Non-Hispanic Black 0.317

12-19 years, Non-Hispanic White vs Non-Hispanic Black 0.004

20-59 years, Mexican American vs Non-Hispanic White 0.053

20-59 years, Mexican American vs Non-Hispanic Black 0.909

20-59 years, Non-Hispanic White vs Non-Hispanic Black 0.001

60+ years, Mexican American vs Non-Hispanic White 0.004

60+ years, Mexican American vs Non-Hispanic Black 0.317

60+ years, Non-Hispanic White vs Non-Hispanic Black 0.004

Winter, Mexican American vs Non-Hispanic White 0.129

Winter, Mexican American vs Non-Hispanic Black 0.642

Winter, Non-Hispanic White vs Non-Hispanic Black 0.19

Summer, Mexican American vs Non-Hispanic White 0.515

Summer, Mexican American vs Non-Hispanic Black 0.492

Summer, Non-Hispanic White vs Non-Hispanic Black 0.162

Mexican American, Summer vs Winter 0.053

Non-Hispanic White, Summer vs Winter 0.000

Non-Hispanic Black, Summer vs Winter 0.017

Table S3. Weighted univariate logistic regression to examine the association of DCBA concentrations above the 95th percentile with season of year, sex, age group, race/ethnicity, income, survey cycle, and creatinine.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Independent variable | | | Odds ratioa | | p value | |
|  |  | |  | |  | |
| Season | Summer | | 5.61 (2.59 - 12.18) | | 0.001 | |
|  | Winter | | ref | |  | |
|  |  | |  | |  | |
| Race | Mexican American | | 0.87 (0.39 - 1.94) | | 0.013 | |
|  | Non-Hispanic White | | 2.68 (1.32 - 5.43) | |  | |
|  | Non-Hispanic Black | | ref | |  | |
|  |  | |  | |  | |
| Income | <$20K | | ref | | 0.016 | |
|  | $20–$45K | | 2.06 (1.18 - 3.62) | |  | |
|  | $45–$75K | | 2.42 (1.29 - 4.55) | |  | |
|  | >$75K | | 2.47 (1.48 - 4.11) | |  | |
|  |  | |  | |  | |
| log10(creatinine) |  | | 4.15 (2.30-7.47) | | <0.001 | |
|  |  | |  | |  | |
| Age group | 6–11 years | | 1.26 (0.73 - 2.18) | | 0.44 | |
|  | 12–19 years | | 1.29 (0.82 - 2.04) | |  | |
|  | 20–59 years | | 1.02 (0.74 - 1.41) | |  | |
|  | 60+ years | | ref | |  | |
|  |  | |  | |  | |
| Sex | Males | | 1.86 (1.25 - 2.78) | | 0.003 | |
|  | Females | | ref | |  | |
|  |  | |  | |  | |
| Survey year | 2007–2008 | | ref | | 0.23 | |
|  | 2009–2010 | | 1.75 (0.69 - 4.42) | |  | |
|  | |  | |  | |

a95% confidence intervals are shown in parentheses

Table S4. Weighted multiple logistic regression to examine the association of DCBA concentrations above the 95th percentile with season of year, sex, age group, race/ethnicity, income, survey cycle, and creatinine.a

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Independent variable | | | | Odds ratio | | | p value |
|  |  | |  | | |  | |
| Race by season | | Mexican American: Summer vs winter (ref) | | | 1.13 (0.26-4.87) | | 0.86 |
|  | | Non-Hispanic White: Summer vs winter (ref) | | | 10.83 (3.28-35.79) | | 0.0002 |
|  | | Non-Hispanic Black: Summer vs winter (ref) | | | 1.67 (0.80-3.46) | | 0.165 |
|  | |  | | |  | |  |
| Season by race | | Winter: Mexican American vs Non-Hispanic Black (ref) | | | 1.32 (0.59 -3.00) | | 0.5 |
|  | | Summer: Mexican American vs Non-Hispanic Black (ref) | | | 0.90 (0.26 -3.07) | | 0.86 |
|  | | Winter: Non-Hispanic White vs Non-Hispanic Black (ref) | | | 0.53 (0.19- 1.49) | | 0.22 |
|  | | Summer: Non-Hispanic White vs Non-Hispanic Black (ref) | | | 3.45 (1.51-7.87) | | 0.005 |
|  | |  | | |  | |  |
| log10 (creatinine) | |  | | | 4.59 (2.31 - 9.13) | | 0.001 |

aRace/ethnicity, season, income, and sex were not in the final multivariate model.