Depressive Symptoms and Environmental Toxicants

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Depression

• Major Depressive Disorder (MDD) is a disorder that is accompanied by persistent feelings of disinterest, and depressed mood, among other symptoms for a period of at least two weeks.1
• MDD is of significant public health concern as it is estimated to effect 16.2 million adults annually in the United States alone1
• Environmental risk factors play a key role in the development of depression
• Environmental toxicants have been shown to play a significant role in the development of other neuronal disorders such as the development of Autism Spectrum Disorder.1

Objectives

• Using method often applied to genomic data, estimate associations between environmental toxicants and depression, controlling for known risk factors of depression in the National Health and Nutrition Examination Survey (NHANES)

Method

Study

• NHANES is a cross-sectional, complex, multi-stage survey sample design conducted in two year cycles at selected places across the United States, allowing for a sample that is nationally representative of all civilian non-institutionalized citizens.4
• Our study population is American adults 20 years and older.

Measures

• Depression phenotype:
  In 1999-2004 depression phenotyping was assessed via an NHANES specific version of the Composite International Diagnostic Interview (CIDI) designed by the World Health Organization (WHO).
  In 2005-2014, was collected via the 9-item patient health questionnaire (PHQ-9)

• Toxins:
  Toxicant were measured in selected subsamples of the survey population.
  Chemicals that were measured in more than 10% of the sample or whose measures were above the limit of detection in at least 70% of the samples were tested using logistic regression

Covariates:

• Sex (m/f), race/ethnicity, cotinine (as proxy for smoking), marital status, education status, poverty index, BMI, urinary creatinine, and wave of NHANES

Statistical Methods

• We followed the methodology laid out by Patel et al to perform an Environmental-Wide Association Study (EWAS)3
• We performed multivariable logistic regressions for each toxicant exposure adjusting for the covariates listed above
• Discovery: waves 2005-2014
• Replication: waves 1999-2004 using a more clinical definition of depression

Results

Table 1. Sample descriptive statistics, NHANES 1999-2014, N=22,429

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Figure 3. Forest plot of odds ratios of toxicants by chemical class, discovery

Conclusions

• This provides evidence that there is a relationship between toxicants and development of depressive symptoms
• There is further need for studies involving chemicals with short half-lives, like toluene, whose effects are hard to observe
• The association seen between depressive symptoms and 1-naphthol may potentially be due to extreme outliers

Future Directions

• Perform survey weighted logistic regression based on NHANES weighting recommendations in order to obtain results generalizable to the Adult U.S. population
• Perform sensitivity analysis adjusting for other comorbidity

References