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Urinary polycyclic aromatic hydrocarbons concentrations and hepatitis B antibody serology in the United States (NHANES, 2003–2014)

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Highlights

- Polycyclic aromatic hydrocarbons (PAHs) are immunotoxic and hepatotoxic.
- PAH exposure was associated with hepatitis B vaccine serology.
- Higher PAH exposure was related to lower odds of serology indicating vaccination.
- Age modified the effect of PAHs on hepatitis B vaccination serology.

Abstract

FEEDBACK

Background

Polycyclic aromatic hydrocarbons (PAHs) are environmental contaminants that are hepatotoxic and immunotoxic. PAH exposure may modulate hepatitis B immunology.

Objective

We used data from 6 cycles of the National [Health and Nutrition](#) Examination Survey (2003–2014) to evaluate the associations between urinary PAH metabolites and hepatitis B serology.

Methods

This analysis included individuals who self-reported receiving ≥ 3 doses of hepatitis B vaccine and urinary PAH metabolites (i.e. 1-naphthol, 2-naphthol, 3-fluorene, 2-fluorene, 1-phenanthrene, 1-pyrene, and total PAH [sum of all metabolites]). Separate logistic regression models assessed the association between hepatitis B vaccination status (i.e. individuals who were immune due to vaccination or susceptible) and tertiles of urinary PAH. Models were adjusted for age, gender, race/ethnicity, survey cycle, family income to poverty ratio, BMI, country of birth, serum cotinine, and urinary creatinine.

Results

Among participants who reported receiving ≥ 3 doses of vaccine and had no antibodies indicating a history of hepatitis B infection and/or current hepatitis B infection, dose-response relationships were observed where individuals with the lowest odds of serology indicating a response to the hepatitis B vaccine (i.e., anti-HBs $^+$, anti-HBc $^-$, and HBsAg $^-$) were in the highest tertile of 2-Naphthol (adjusted Odds Ratio [aOR]: 0.70, 95% confidence interval [CI]: 0.54, 0.91), 3-Naphthol (aOR: 0.68, 95% CI: 0.53, 0.87), 2-Fluorene (aOR: 0.61, 95% CI: 0.54, 0.86), 1-Phenanthrene (aOR: 0.79, 95% CI: 0.65, 0.97), 1-Pyrene (aOR): 0.68, 95% CI: 0.55, 0.83), and total PAH (aOR: 0.73, 95% CI: 0.56, 0.95) had the compared to the lowest tertile.

Conclusion

This cross-sectional study supports a hypothesis that PAH exposures experienced by the general US population may modulate hepatitis B vaccine induced immunity. Given the ubiquity of PAH exposures in the US, additional research is warranted to explore the effects of chronic PAH exposures on hepatitis B related humoral immunity.



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Keywords

Hepatitis B surface Antibody; Hepatitis B surface Antigen; Immunotoxicity; Infectious disease; Immunosuppression; Air pollution; Epidemiology; Vaccine

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