

Clinician Understanding of Environmental Influences on Human Health

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The occurrence of chemicals in the environment is an indisputable necessity for modern innovation, however despite the contributions made by chemicals to society, the dramatic increase of toxicants present in everyday settings is unsustainable. In the United States alone, there exist over 80,000 chemicals registered under TSCA, (the Toxic Substances Control Act), with many of them traversing through consumer goods from factories into our homes. Few have undergone mandatory testing before entering the market, and this lack of effective oversight contributes to the problem that many products, ranging from diapers to strawberries, carry chemicals with unknown side-effects. The resulting abundance of unregulated substances poses escalated risk to human health, due to persistent exposure. In parallel with the rising threats to human health is the concern that clinicians are not adequately prepared to accurately identify or proficiently treat diseases stemming from environmental influences such as pesticides and flame retardants. To evaluate this concern, a questionnaire was drafted, aimed at broadly assessing the knowledge of medical providers regarding possible environmental causes of human health conditions.

In preparation for conducting the research, a preliminary survey was drafted. The purpose of the first questionnaire was to receive feedback in order to further improve the structure and content of the questions. This draft was sent to 37 healthcare professionals from various fields with a response rate of 30%, garnering input from eleven sources, as seen on page 5. The participant range was intended to be inclusive, being comprised of clinicians from the regional and local scale, to large organizations like the National Institute of Environmental Health Sciences and the Science Environmental Health Network. Overall the feedback resulting from this initial outreach emphasized the importance of prevention and affirmed the notion that most practicing clinicians were not sufficiently knowledgeable on how environmental influences interact with human health. Additionally, many of the physicians provided existing studies regarding this problem. The general consensus communicated by previous

research proved that there existed a gap concerning the knowledge of environmental influences and human health. In determining this, the studies considered a multitude of variables such as gender, region, practice type, and the use of environmental history forms, to estimate the knowledge of their intended focus group. Among the clinicians who participated in previous studies, most supported the need for further education and training on how environmental exposure affects the population. This relative consensus largely impacted the direction of this study, by causing the primary question to shift from investigating if there was a problem to focusing on how to fix it.

The intention of this research has become an effort to provide alternative methods of education about environmental exposures, and to improve the current structure of teaching about toxic exposures in medical schools. Informed by previous research and reaffirmed by the feedback in our own study, we see the opportunity to improve how clinicians are taught and broaden their understanding of environmental influences on human health. An initial action to encompass and emphasize the presence of toxicants and their influences on human wellbeing would be to conduct a pilot study which would prove the need for more education. This would involve selecting clinicians from a variety of healthcare professions and evaluating their knowledge of environmental toxicants, and how to prevent and treat exposures. The study could then serve as the basis for more extensive outreach and encourage the evolution of modern teaching models to better prepare clinicians practicing in the current toxicant- intensive environment. We recommend beginning with a pilot study using the questionnaire we have developed below, with the intent of using that information to design a wide-scale survey aimed at assessing the state of knowledge, and showing where education can improve the response of the medical community.

Survey on Health Provider Awareness of Toxic Exposures

Are you familiar with the purpose of environmental history forms?

Yes No

Do you use environmental history forms to examine patient exposure in the home or workplace?

Yes No

Most health care providers recognize the effects of environmental toxins in their practice

Yes No

Do healthcare providers recognize the relationship between environmental toxicants and symptoms associated with exposures such as:

	Likely	Possibly	Not likely
Asthmagens (Isocyanates, Chlorine, Quats, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cosmetics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Household dust	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flame retardants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Formaldehyde	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contaminants in water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lead	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nail Polish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pesticides	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Phthalates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hair Products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sealants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tobacco smoke	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mold	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What symptoms suggesting toxicant exposure would prompt you to administer blood or urine tests?

If you conduct, what findings in an environmental history form prompt blood or urine tests?

In what settings were you taught about toxics in the workplace? *(check all that apply)*

- Medical school
- Residency
- Certification program
- Occupational training
- Voluntary workshop
- Not taught

In what settings were you taught about toxics in consumer goods? *(check all that apply)*

- Medical school
- Residency
- Post medical school education
- Occupational training
- Voluntary workshops
- Not taught

Do you know toxicology specialists to refer patients to?

Yes Maybe No

Do you consider environmental exposures when diagnosing patients?

Yes Depends No

Explain reasoning:

Do you think there is an increase of toxicants in the average body to be concerned about?

Yes No

Is the medical community paying sufficient attention to environmental toxic exposure?

Yes No

Explain reasoning:

Does your practice inform patients of environmental exposures from consumer goods and the workplace?

Yes No

Would your practice provide patients with environmental health information if given the necessary resources?

Yes No

What would be your preferred method to learn more about this subject? *(check all that apply)*

- Newsletter
- Workshop
- Lecture
- Conference
- Certification program
- Online

FEEDBACK FROM 1ST DRAFT:

Linda Birnbaum, PhD, DABT, A.T.S (*Director, National Institute of Environment Health Sciences; Director, National Toxicology Program*)

“A few comments:

1. Do you only want doctors to answer this? What about other health care providers such as nurse practitioners? Physician assistants?
2. The only “symptoms” that doctors could see what suggest poisoning. We don’t want exposures to be that high. Better to ask questions which would raise issue of monitoring of environment or of biomonitoring of patient’s blood or urine.
3. Very few physicians would know what to look for or where to go to get testing.

Hope this helps!”

Jeanne Conry, MD, PhD (*Past President, American College of Obstetricians and Gynecologists; Assistant Physician and Chief, The Permanente Medical Group*)

“I made suggestions. I am assuming you would like to change behavior so it would be helpful to ask participants how they would like to learn about this topic, so I suggested changes or additional questions. Also, the structure of questions is heavy in terms of work on your part,. It is much easier to read and answer easy yes no rather than written responses. This questionnaire cannot be on line so you might simplify the format. I gave examples

Good luck, thanks for pursuing this topic. Please share the results. We are working to educate health care providers”

Refer to attachments

Ted Schettler, MD, MPH (*Science Director, Science and Environmental Health Network*)

“The paper by Trasande et al might give you some ideas about additions or ways to classify. For example, a question about drinking water quality at all. Or a question about cosmetics and other personal care products at all.

I'm attaching your draft questionnaire with a few comments. Also attaching two papers (you may have seen these already) in which a similar questionnaire was developed and used for slightly different purposes. It will give you an idea about how those authors organized the exposures of concern. See for example fig 1 in the peds paper.

Also, as I mentioned in comments, I think you should ask about exposures in addition to symptoms. Doctors should be taking an environmental history from patients/families more routinely and when an answer suggests that a harmful exposure might be occurring, it should be further investigated, even if a patient has no apparent symptoms. This is when there's a real opportunity for prevention. Hope this helps. Let me know if any question."

Refer to references and attachments

Asa Bradman, PhD, MS (*Associate Director, Center for Environmental Research and Children's Health; Professor, School of Public Health, UC Berkeley*)

"Bolaji - I am forwarding your note to Drs. Miller and Leonard at the UCSF Pediatric Environmental Health Specialty Unit. Best, Asa"

Mark Miller, MD, MPH (*Director, University of California San Francisco Pediatric Environmental Health Specialty Unit*)

"I case you do not already have these, here are three papers that might be of help in seeing things that have been done to date. There is also a survey of Ob Gyns similar to these. I am attaching my review with a variety of comments. I hope that this is helpful. Vickie please add this to the report record wherever this is appropriate.

Thanks"

Refer to references and attachments

Bruce Lanphear, MD, MPH (*Clinician Scientist, Child & Family Research Institute; Investigator, BC Children's Hospital; Professor of Health Sciences, Simon Fraser University*)

“There are some existing surveys designed by the Pediatric Environmental Health Specialty Unit. Sophie Balk and Leo Trasande also designed clinical surveys for environmental hazards and conducted surveys to pediatricians about environmental health issues. I would examine those before you try to design a new one.”

Russ Hauser, MD, ScD, MPH (*Frederick Lee Hisaw Professor of Reproductive Physiology; Professor of Environmental and Occupational Epidemiology, Harvard T.H Chan School of Public Health; Professor of Obstetrics, Gynecology and Reproductive Biology, Harvard Medical School*)

“Dear Bolaji, thanks for sending this to me and it is great that you are working on this for your class. I made a few comments. I would suggest looking up a paper by Tracey Woodruff and colleagues where they published on a survey among obstetricians about toxic exposures. It was published a few years ago but you can easily locate it in pubmed.”

Refer to attachments

Sarah Berry, MD (*Geriatrician and Clinical Researcher, Beth Israel Deaconess Medical Center*)

“Shorten the survey – reduce number of questions. You won’t get a good response rate with this. Rather than ask were you taught about....., ask how much teaching did you receive on.... Answers could be something like: A) none b) 1-3 lectures 3) part of a course, more than 3 lectures, or d) other: _____”

Deborah Hirtz, MD (*Professor of Neurological Sciences and Pediatrics, University of Vermont School of Medicine*)

Responded to survey questions.

Refer to attachments

Hugo Aparicio, MD, MPH (*Assistant Professor of Neurology, Boston University School of Medicine; Investigator, The Framingham Heart Study*)

Responded to survey questions.

Refer to attachments

Olufunke Pickering, MD, MBA (*Pediatrician, Chase Brexton Health Care*)

Responded to survey questions.

Refer to attachments

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3. Trasande L, Boscarino J, Graber N, Falk R, Schechter C, Galvez M, Dunkel G, Geslani J, Moline J, Kaplan-Liss E, Miller RK, Korfmacher K, Carpenter D, Forman J, Balk SJ, Laraque D, Frumkin H, Landrigan P. The Environment in Pediatric Practice: A Study of New York Pediatricians' Attitudes, Beliefs, and Practices towards Children's Environmental Health. *J of Urban Health: Bulletin of New York Academy of Medicine* 2006; Vol. 83, No. 4.
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5. Zachek CM, Miller MD, Hsu C, Schiffman JD, Sallan S, Metayer C, Dahl GV. Children's Cancer and Environmental Exposures: Professional Attitudes and Practices. *J of Pediatric Hematology/Oncology* 2015; 37:491-497.