

Challenges Faced in Communicating Biomonitoring Data to the Public At Large
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When we designate chemicals as toxic substances, Paracelsus roles over in his grave. The terms “toxic substance” carries a lot of weight with the public, and it ignores dose-response! It gets us off to a bad start.

Chemical technology – reality of exposure is with us at all times, we are chemically dependent. We develop chemicals of concern – the term “toxic substances” carries different baggage within society.

Oxygen is the chemical we are most exposed to. It has a low margin-of-exposure. Need perspective. Talking about thousands of chemicals out of all the millions of chemicals known. The scheme to look at them is the NAS Risk Assessment paradigm that pairs hazard identification and dose response on the toxicology side and use and exposure assessment on the other. Too frequently, issues of public concern are driven by the hazard identification step – something that causes an effect – it needs to be paired with dose response data. Exposure assessment is getting more sensitive, but again, dose response needs to be communicated as a critical determinant of risk.

Important because public has 2 basic views: Group 1) concerned on “how little is okay” – dose makes the poison – we can describe safe levels – these people have an awareness of the limitations of toxicity testing, Group 2) “how much is too much” – these people subscribe to an “all-or-none response,” if you’re exposed, you will get a disease even at low exposures – they express little confidence in the relevance of testing to their health. What is the breakdown between the 2 groups: about 30:70. Presents a real problem in public opinion and promotes the “Chicken Little” complex – the sky is falling!

How did this start?

Cranberry scare of 1957 – WA and OR - aminotriazole found in small amounts in cranberries; coincided with the finding that aminotriazole was carcinogenic in rats. The Secretary of HEW recommended against purchasing cranberries. However, the dose bore no relation to human experience: 15,000 lbs / day in humans were required to get the rat dose!

Silent Spring – 1962 – contribution of this book to public awareness of chemicals in the environment is unsurpassed. Useful that we discovered the persistence of chemicals in the environment, during times when chemicals with very low toxicity were used, their issues being due more to persistence than toxicity. Persistent chemicals, chlorinated hydrocarbons, are everywhere, and if you prescribe to the “all-or-none” viewpoint, you will be unhappy. Carson refers to the “load of chemicals in the body” and the environment – and cast the chemicals as “Elixirs of Death.”

The book triggered an increased aversion to risk – many regulations were passed in the 1970s. Seeking a freedom from risk is why many regulatory agencies are in business

(EPA, OSHA, etc.). However, we must recognize that risk cannot be simply turned on and off. The lines are fuzzy between risk and benefit.

We would do well to clarify costs of risk reduction. Regulations often have a high cost per life saved. Magnitude of risk, tradeoffs, and cost-effective risk mitigation should receive greater consideration. We seem to spend more and more chasing less and less because we can measure smaller and smaller amounts all the time. However, what is the message we carry after we measure a tiny amount of a chemical that is harmful in excess?

Progress in occupational exposure is a good model for environmental biological monitoring. In the workforce, susceptible populations are not the primary issue, but data more relevant than rat data to public health are most valuable. There are several important areas of biological monitoring: forensic, clinical, etc. Risk communicators should be able to get a lot of mileage out of ethanol-- absorption and elimination as an example of a chemical with acute and chronic toxicities in the human body. It is a familiar substance with high “attention getting value”—and like many other chemicals.

Treat any exposure information first from the chemical perspective and then as it relates to technology. Several standards are published – TLVs, BEIs, etc. BEIs are a good model for understanding potential health impacts of environmental chemicals. Recall that TLVs and BEIs do not produce an increased risk of disease. CDC biomonitoring data are compilations of “what,” but do not give any information about the significance of the findings and risk, unlike the TLVs and BEIs. The health aspect needs to be treated as rigorously as possible—in parallel with the first-rate analytical chemistry that is done at CDC. The system probably creates as much fear and anxiety as provides understanding in its present form.

Body burdens – we can predict chemicals that will establish a body burden based on solubility and reactivity. Low reactivity and low solubility chemical will usually persist to some extent in the body fat. Chemicals are not just being added “willy nilly” to our bodies-- there is a flux – some goes in and some goes out, not necessarily 1:1. It is good to mention to the public that they are not molecular garbage bags--it is true to the science to emphasize that chemical exposures occur in a dynamic, living system.

Emotional dimension of chemical body burdens is very strong in some persons. Persons who subscribe to “all-or-outcomes” of exposure have a hard time dealing/accepting the idea that exposure is not a one-way process.

3rd National CDC Report – troublesome group are chemicals they have labeled “Pesticides.” Chlorinated hydrocarbons, levels have been going down and down, they have not been related an adverse effect. Organophosphate insecticide metabolites and pyrethroid metabolites – numbers are increasing with time, but the most contaminated people in the Report are healthy. There are many non-pesticides on the list. They are metabolites that may come from the environment, food, or be produced by an exposed person. Should be a category for pesticide metabolites – DDE is not an insecticide and on and on. At least 20 of chemicals listed as Pesticides are actually breakdown products

that are non-toxic. The Report will be stronger with a clear message about the nature of the pesticide metabolites.

Key to CDC biomonitoring perspective is the interpretation of the data – the fact that “small amounts may be of no health consequence” is too frequently overlooked. Need to describe benefits – many possible outcomes.

Summary

Encourage the recognition of the realities of chemical exposure. It is an ever-present characteristic of our lives. Talk about chemicals first and technology second.

1. Need judgment on persistent chlorinated hydrocarbons – they have been around for more than 50 years. A judgment about health is overdue.
2. Need an index for biomonitoring work – Human Exposure Index – HEI.
 - a. CDC knows how to measure chemicals,
 - b. Physicians need to determine the health risk,
 - c. EPA can mitigate the risk.