

Report 88: Next Steps for Exposure Biology

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Brief History:

Wild (2005) defined the concept of the exposome as the accumulation of exposures over a lifetime; the concept integrates a continuum of exposure, susceptibility and response. In 2007 NIEHS lead a trans-NIH effort to establish the concept of Exposure Biology which was intended to provide measures of chemical exposures, dietary intake, physical activity and psychosocial stress in time and space and to enable a linkage of those measures of the personal environment to alterations in biological pathways. In principle the measures from the Exposure Biology Program provide a snapshot of the exposome. The current EBP tools exist as functional prototypes suitable for pilot testing in focused epidemiological studies but as of yet have not been integrated to provide a complete glimpse of the personal environment.

Discussion Highlights:

Exposure Biology provides a potentially very powerful tool for discovery in environmental health that can aid in teasing out the interaction between external factors, internal factors and response that underlie human disease. The concept of a suite of tools that integrate external contact, internal exposure and biological response remains a novel idea which is becoming reality thanks to the leadership of NIEHS.

Recommendations:

While an excellent start, the current EBP tools are very limited. An effort needs to be made to increase the chemical space covered. This could potentially include an emphasis on functional identification of exposures (based on biological activity rather than chemical identity). It is also recommended that sensors be developed with a modular format that would allow adaptation to emerging chemicals of interest or tailoring to epidemiological study design. A particular weakness of the current EBP effort is in the focus on airborne analytes and effort should be made to measure dermal exposures. More importantly, an effort to measure internal exposures is needed which would allow quantitation of oral route of exposure and of compounds with mixed route of exposure and provide a strong linkage between contact and response.

An effort is needed for integration of the EBP (and similar) tools to provide the complete view of the exposome at that snapshot. This includes the need to establish a proof of principle for the concept that integrating chemical exposures with lifestyle factors provides additional biological insight.

An effort is needed to facilitate data handling and analysis, particularly for real time-spatially resolved data and to facilitate interpretation of how pathway-based response relates to exposure.

The devices developed need to be made scalable so that they can be applied to large scale cohorts such as NHANES and the National Children's Study. A critical aspect here is the continued validation of the prototypes and the establishment of commercial partnerships to make them more broadly available.

Finally, the effort to increase awareness of the tools needs to continue. In addition to the currently implemented strategies such as sessions at major meetings, web presence and publications we can use strategies such as blanket mailings and social media avenues such as Tweeting.

Discussion Participants:

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