

Challenges and Opportunities in implementing the Exposome

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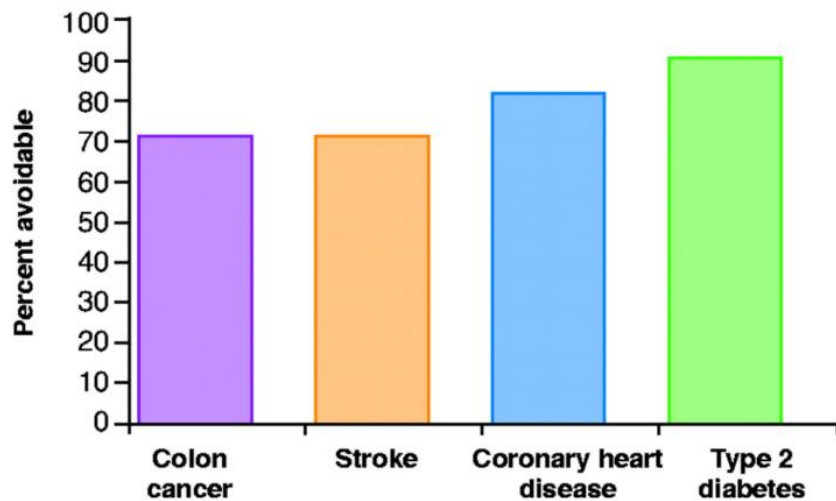
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The environmental contribution to 'complex' diseases

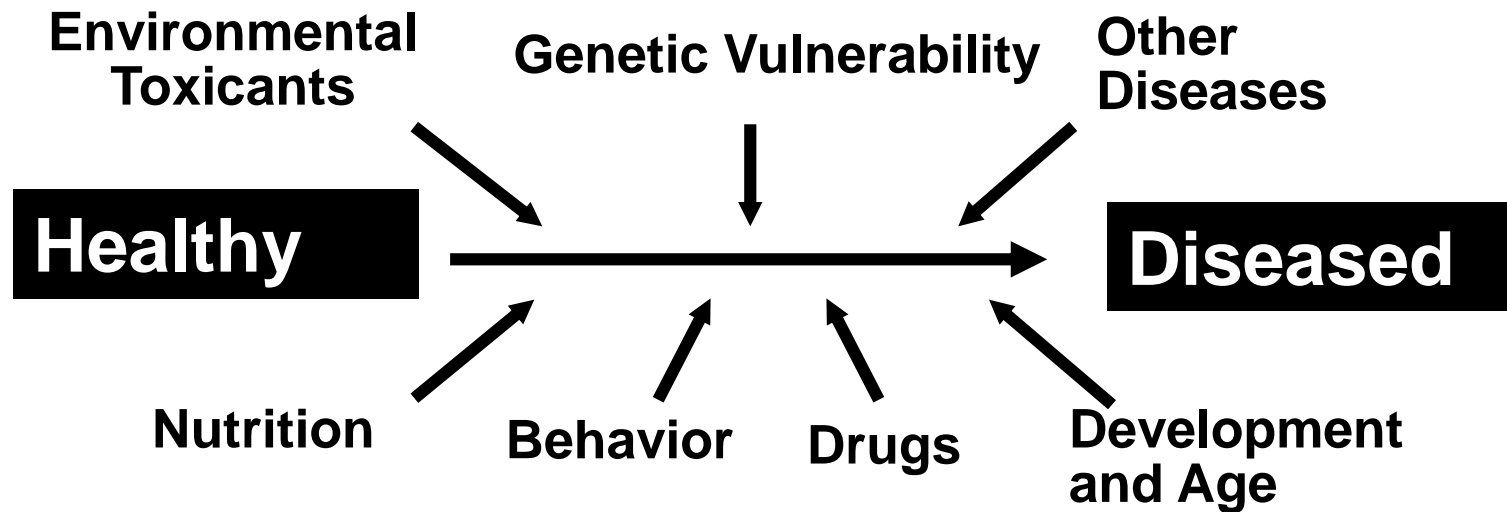


Willett, WC, (2002) Science 296:695-8

“Advancing environmental health research offers us the best opportunity for preventing disease – because you can’t change your genes, but you can change your environment.”

Linda S. Birnbaum, Director, NIEHS

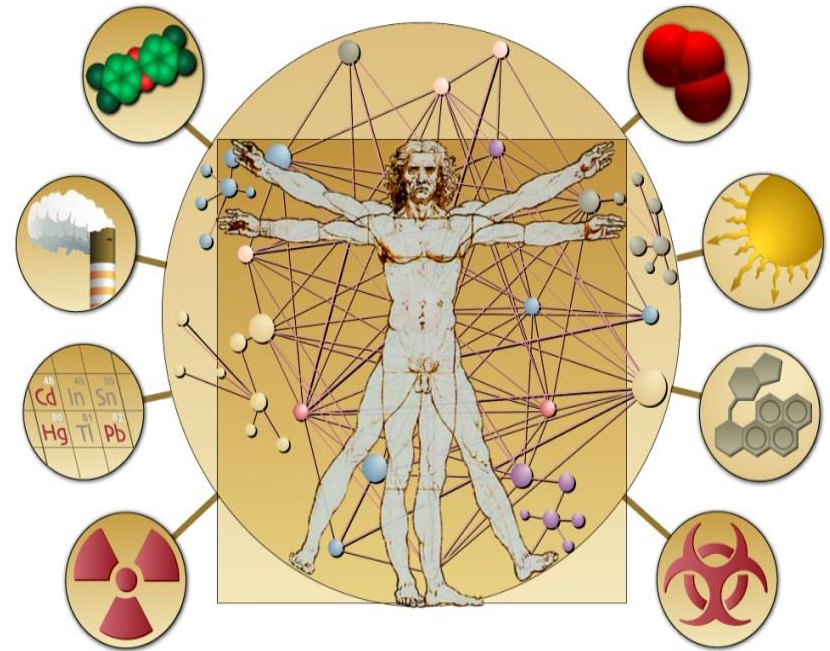
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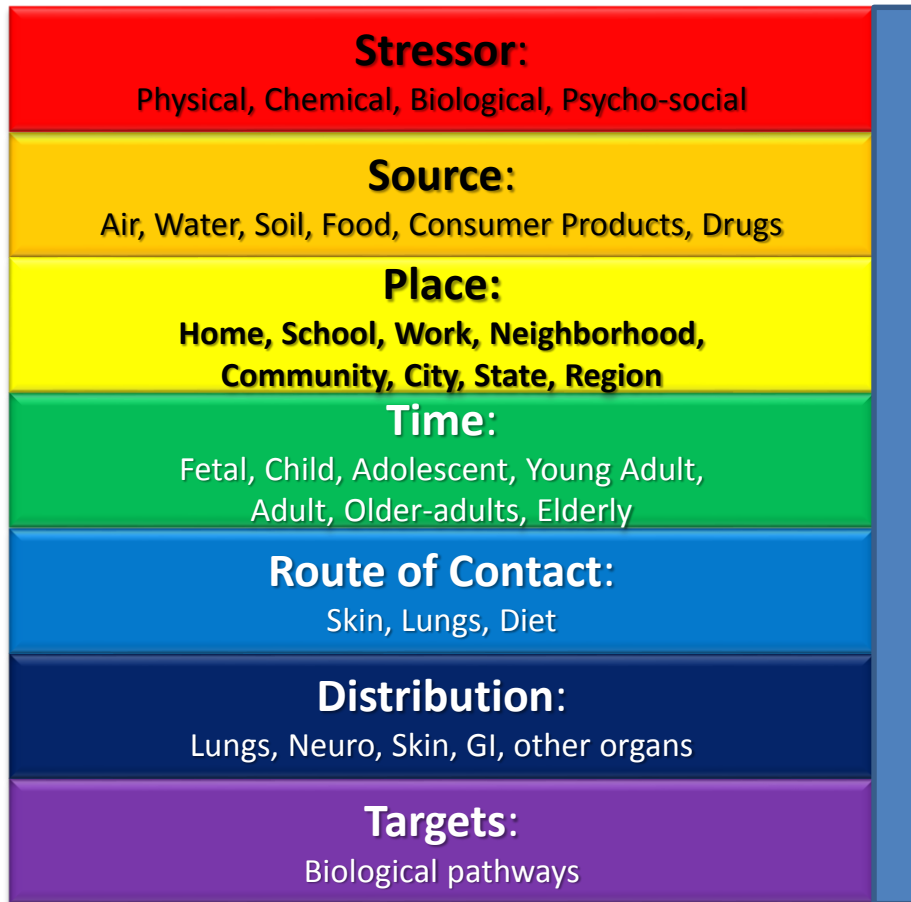
What is NIEHS doing?

Strategic Goal 3: Transforming exposure science

- Advance characterization of environmental exposures through **improved exposure assessment** at both the individual and population levels
- Define and disseminate the **concept of the exposome**
- Create **tools and technologies**, and the research **capacity**, needed to **characterize the exposome**



The Complexities of Exposure



The Exposome (Wild, 2005): The totality of exposure an individual is subjected to from conception to death...the 'environmental' correlate to the genome.



There are multiple conceptualizations of the EXPOSOME...

Wild

- **All life-course environmental exposures** from prenatal period onwards; includes internal body processes, external exposures, and lifestyle factors.

Rappaport and Smith

- Total exposures throughout life, where the “environment” is the body’s internal chemical environment and “exposures” are all the **biologically active chemicals in this internal environment**.

Buck Louis

- **Mixture of environmental exposures**, including man-made and naturally occurring chemicals, physical agents (e.g., noise, vibration, temperature), **macro level factors** (e.g., population density, sanitation), and **lifestyle factors**.

Miller

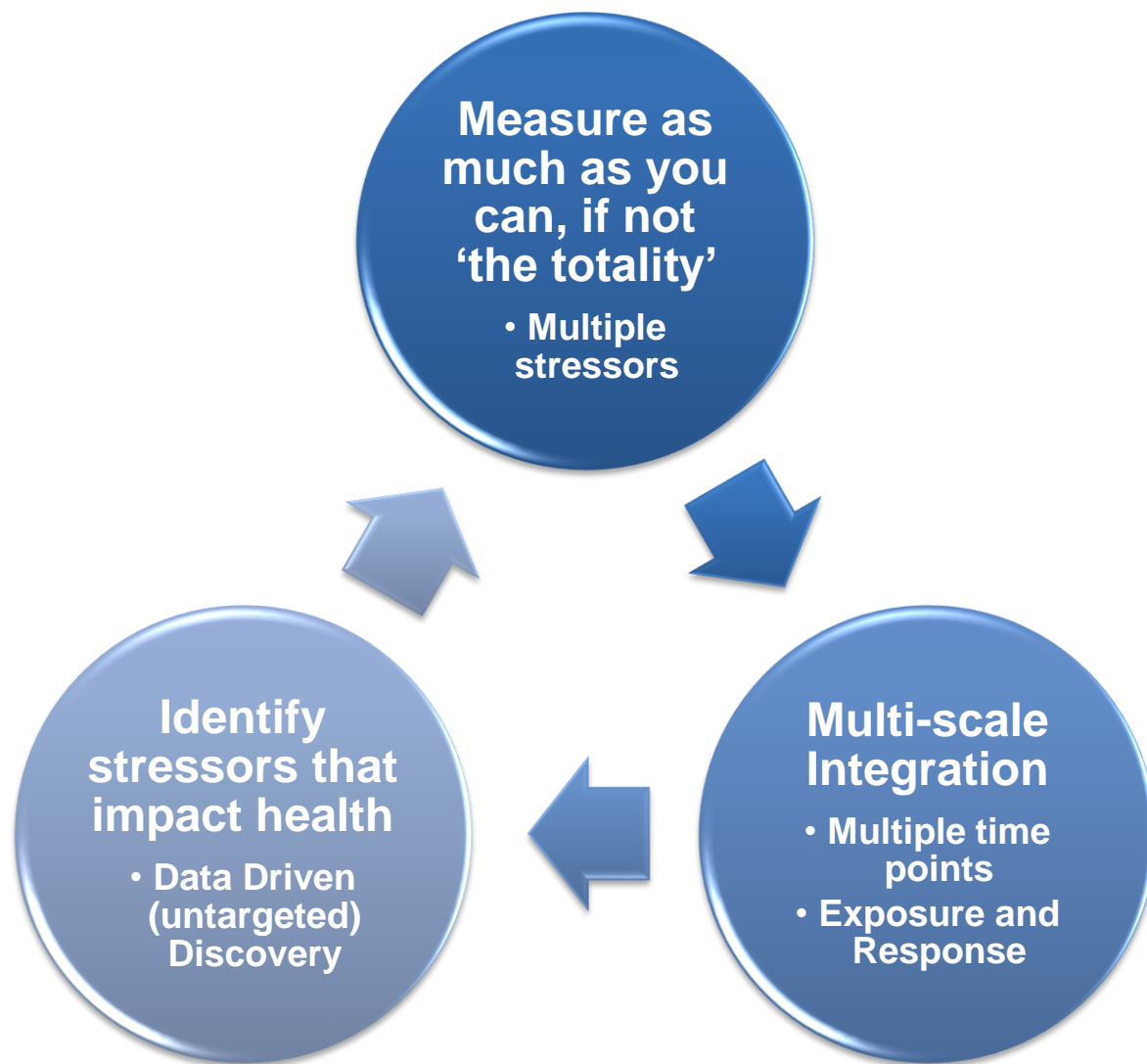
- **Measurable environmental influences and cumulative biological responses** throughout lifespan; includes exposures from the environment, diet, behavior, and endogenous processes.

NRC Report

- “**Eco-exposome**” extends concept from point of contact between stressor and receptor, **inward into organism and outward to general environment**.

... and a need to develop a unifying conceptual framework.

Common Elements of The Exposome Concept



Challenges

Sociological

- Advancing and defining the exposome concept
- Integration of different stakeholder perspectives
- Willingness to do untargeted discovery

Technological

- Integration external exposure and internal response
- Technologies for multi-analyte exposure assessment
- Conceptual frameworks for data-driven and untargeted analysis
- Advances in statistical methods to handle the complex, interrelatedness, and dynamic nature of exposure data

Logistical

- Time scale: Lifetime; Windows of Susceptibility; Prospective vs. Retrospective
- Sample collection, size, power and analysis
- Collaboration and Data sharing

Activities and Opportunities at NIEHS

Promoting the Concept

- Strategic Plan Focus
- Numerous presentations/sessions and symposia

Developing and Translating the Capacity

- Tools and Technologies for multi-scale measurements
- Big Data Science and methods for integration and discovery

Coordination

- Trans-NIEHS and –NIH working groups
- Interagency Coordinating Committee on Exposure Science
- International Coordination with EU Framework 7 Programmes

Thank you for listening.

Any questions?