
Janet Gray, Ph.D.
State of the Evidence: What is the connection between breast cancer and the environment?

State of the Evidence: The connection between breast cancer and the environment

Nancy Evans, Health Science Consultant, Breast Cancer Fund

IJOEH 2009
State of the evidence 2017: an update on the connection between breast cancer and the environment

Janet M. Gray\textsuperscript{1*}, Sharima Rasanayagam\textsuperscript{2}, Connie Engel\textsuperscript{2} and Jeanne Rizzo\textsuperscript{2}
Goals for SOE-17

• Provide comprehensive review of scientific literature
• Frame evidence within critical conceptual areas
• Concentrate on materials from the past 8-10 years
• Offer methodological critiques, prospective views on what is needed over next several years
Types of Studies Described

• Human epidemiological and clinical
• Animal (primarily rodent)
• Cell culture
• High through-put and other molecular approaches

• Why this combination of approaches is so important for evaluating links between environmental toxicants and disease risk.
Complexity

Goal: To make the landscape more complex than sometimes individual studies suggest

• Breast cancer subtypes
• Race/ethnicity

• Framing concepts
  • Low-dose and non-monotonic responses
  • Interactions between environmental toxicants
  • Gene-environment interactions and epigenetic changes
  • Cell-cell interactions
  • Timing of exposures
State of the Evidence: Categories of toxicants

- Hormones: Pharmaceuticals and personal care products
- Endocrine-disrupting compounds (EDCs)
- Hormones in food: Natural and additives
- Non-EDC industrial chemicals
- Tobacco smoking: Active and passive
- Shift-work, light-at-night and melatonin
- Radiation
Endocrine Disrupting Compounds (EDCs)

- DDT/DDE
  - Best epidemiological data for EDCs
  - Timing of exposures
  - Methodological factors

- BPA
  - Animal and mechanistic data
    - Including similarities with DES
    - Pharmacokinetics
  - Early exposures and NMR dose effects
    - Morphological changes
    - Functional changes
  - Decreases efficacy of common chemo drugs
Light at Night (LAN)

- Epidemiological and mechanistic data
- Occupational exposures
- Possible ethnic interactions
- Methodological issues
Discussion and Conclusions

• Last 8 years, 100s of new articles, enhanced by greater depth, breadth and complexity

• Especially strong in EDCs and timing of exposures

• Enhanced epidemiological evidence:
  • Developmental exposures to DES, DDT and radiation
  • Adult exposures to oral contraceptives and HRT
  • Protective effects of soy-based diets

• Animal and genomic studies
  • Greater understanding of subcellular and intercellular mechanisms
  • Genetic vs. epigenetic processes
Discussion and Conclusions

• Methodological issues
  • Epidemiological studies: Lack of direct measurements of toxicant levels across lifespan
  • Lack of regulatory standards for inclusion of mammary endpoints
  • Lack of standardized protocols

BUT ...
“Despite these critical methodological limitations and concerns, the breadth and strength of the evidence cited in this review, when taken as a whole, reinforce the conclusion that exposures to a wide variety of toxicants – many of which are found in common, everyday products and byproducts – can lead to increased risk for development of breast cancer. As concluded by the reports of the Presidential Cancer Panel and the Interagency Breast Cancer and Environment Research Coordinating Committee, it is critical to recognize the growing literature demonstrating connections between exposures to environmental toxicants and later development of disease, including breast cancer, and to prioritize prevention both at the research and the public health levels.”