



HUMAN HEALTH RESEARCH PROGRAM

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RESEARCH SHOWS THE IMPORTANCE OF CHEMICAL MIXTURES ON THYROID FUNCTION

Issue:

Chemicals pervade our world – in the air we breathe, the water we drink, and the products we use. The U.S. Environmental Protection Agency constantly studies the many ways our bodies are affected by different types of chemicals. In one area, scientists are learning more about the risk of simultaneous exposure to multiple chemicals that disrupt thyroid hormones. A goal of this research is to protect the most sensitive populations, especially children and older adults, from adverse effects on the development of their nervous system.

Proper thyroid operation is essential for the developing child before and after birth, and for a number of physiological processes in adults. It's widely known in the scientific community that a number of individual chemicals on their own and at high concentrations can lead to disruption of thyroid activity. Relatively little is known, however, about how combinations of chemicals at natural exposure levels affect the thyroid. For example, are mixtures of such chemicals additive, synergistic or antagonistic? In other words, do their effects simply combine, multiply upon combination, or tend to cancel each other out?

Science Objective:

A team of researchers with EPA's Office of Research and Development designed a study to test the additivity theory for a large mixture of polyhalogenated aromatic hydrocarbons (PHAH's), a family of chemicals that are known to disrupt thyroid activity. At low dosing, researchers concluded that the thyroid disrupting chemicals interacted in an additive manner. This suggests that while each individual chemical alone may not be enough to cause any noticeable effect, the cumulative affect of several chemicals could. At higher exposures, above those to which humans are normally exposed, researchers found a small synergistic effect on thyroid hormone disruption, meaning that the affects of the chemicals don't simply accumulate; essentially, they multiply by some new factor.

Application and Impact:

Research analyzing the additive effect of thyroid disruptors is illustrating the importance of studying chemical mixtures and the potential impact on human health. This research is filling knowledge gaps and providing critical science needed to improve the ability to assess the risk of multiple chemicals that impact thyroid function. EPA

research in this area falls under the Food Quality Protection Act (FQPA) of 1996 which mandates the assessment of risks that result from exposure to multiple, similar-acting chemicals.

Ongoing research will provide a broader understanding of the ways in which chemicals interact to disrupt the functioning of thyroid hormones, providing important information to environmental risk assessors and managers.

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