



Chemicals and Endocrine Disruption

The endocrine system is one of the most complex systems in the human body. It is responsible for the regulation of hormone levels and maintaining a number of critical human functions such as metabolism and growth and development. Many things can be shown to interact with the endocrine system – stress, food, and exercise, as well as naturally occurring and synthetic chemicals. One of the most common misconceptions about the interaction between chemicals and the endocrine system, however, is that any interaction whatsoever will unavoidably lead to adverse health effects. This is not true, and it's important that the scientific community and regulatory agencies clearly communicate the difference between *endocrine disruption* and *endocrine activity* when speaking about, testing, and regulating chemicals for potential impacts on the endocrine system.

What is an Endocrine Disruptor?

An *endocrine disruptor* is a substance that alters the function of the endocrine system and consequently causes *adverse health effects* to an organism.

It's important to distinguish between substances that may interact with the endocrine system from actual *endocrine disruptors* that cause adverse health effects. Not every change in the endocrine system will lead to an adverse effect. Similarly, not every substance that interacts with the endocrine system will cause an adverse effect. Certain natural substances, in addition to some synthetic chemicals, can be shown to have the potential to interact with components of the endocrine system while *not* causing any changes in function of the organism whatsoever; or they may cause transient effects which are readily reversible and do not result in adverse health effects. Just because a chemical interacts with the endocrine system does not mean it is an endocrine disruptor.

Are there safe levels of Exposures to Endocrine Disruptors?

Yes, there are safe levels of exposures – exposures to such substances may be at dose levels and durations, which are below the threshold for causing adverse health effects. The presence of a substance that has adverse effects at some level does not imply that the presence of that chemical will lead to adverse effects at all levels. Exposure to trace levels to a chemical – whether it's a chemical identified as an endocrine disruptor or not – does not signal impending harm to health. As the Centers for Disease Control and Prevention emphasizes, "The measurement of an environmental chemical in a person's blood or urine does not by itself mean that the chemical causes disease."

Risk-Based Decision-Making and Evaluating Substances that Interact with the Endocrine System

The Organisation for Economic Co-operation and Development (OECD) and the U.S. Environmental Protection Agency (EPA) have developed scientifically-validated screens and tests for identifying chemicals with endocrine active properties to permit science-based examinations of the endocrine disruptor issue. Due to these efforts, regulatory agencies today have access to toxicological screening test guidelines that are relevant, reliable, sensitive, and specific for evaluating the potential for substances to interact with the estrogen, androgen, and thyroid pathways.

It is important to also note that today's standardized toxicological tests in laboratory animals *do* take into account the potential pathways that a chemical could act upon to cause adverse effects, including



endocrine pathways. In other words, if a substance causes an adverse health effect via an endocrine pathway (i.e., the substance is an endocrine disruptor), this will typically be revealed through standardized toxicological testing using validated regulatory agency test guidelines.

Regulatory decisions about chemicals that may affect the endocrine system need to be based on a combination of factors – whether a chemical causes endocrine-related activity; what are its potency, levels and means of exposure to the chemical; whether it produces adverse effects and if so, at what dose levels; and what is the life-stage and susceptibility of an individual.

Regulatory approaches to address the issue of health or environmental concerns for endocrine disruption should incorporate the following steps:

- 1) Use scientifically valid screening assays and tests for evaluating substances;
- 2) Implement a rigorous and systematic framework for conducting a weight-of-evidence evaluation that integrates data and information from all relevant and reliable studies;
- 3) Provide opportunity for stakeholder review and comment and independent peer review; and
- 4) Use risk-based decision making, taking into account both hazard and potential exposures.

Decisions not based on the best science and on established risk assessment and management procedures can misallocate limited resources, limit the use of beneficial chemicals, and create potentially unnecessary public health concerns.

The American Chemistry Council (ACC) supports risk-based programs intended to develop, standardize, and validate methods to study substances and their potential effect on the endocrine system.

