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Hormone Disrupting Chemicals in our Homes;

Plastics are an essential part of our modern life. We've long been taught and conditioned that they're inert, they don't react and are perfect for storing, protecting, separating many different objects. They are air and liquid tight which makes them very handy for storing food and have seemed to be safe for use in microwave ovens to conveniently heat and eat the food that has been safely stored.

The question is whether this is true or merely what we've been lead to believe. The stakes are huge! Currently annual production of BisphenolA, just one of these agents is over *7 billion* pounds! That's a lot of food storage, toys and household implements!

Endocrine Disrupting Chemicals (ECDs) can also mimic, block, alter synthesis, transport, binding and metabolism of our hormones. Hormones are essential to life! Without hormones there would be no difference between men and women, no human growth and development. Any woman going through the turmoil of menopause knows how a little decrease in key hormone levels can cause misery.

Just what are the plastics involved here?

There is an earlier article published in this space on *Phthalate Toxicity*, which lists some of the agents involved such as;

Di-N-Butyl Phthalate (DBP) an industrial solvent

Diethyl phthalate (DEP) another solvent

Bis-2-ethylhexyl phthalate (DEHP); Primarily used to produce flexible plastics

Other compounds include the fluorinated hydrocarbons, everybody recognizes the name "Teflon" which is one of the many chemicals in this class including perfluorooctanoic acid which is also used to waterproof and act as a stain repellent on many textiles.

Polybrominated diphenyl ethers added as flame-retardants to computers, televisions, and furniture.

BisphenolA is a component of hard plastics that leaches from plastic containers and liners of metal cans.

This compound is the base chemical (monomer) used to make polycarbonate plastic food and beverage containers, the resin lining of cans, and dental sealants; it also is found in "carbonless" paper used for receipts as well as a wide range of other common household products. Based on their analysis of data from the National Health and Nutrition Examination Survey 2003-2004, Lang et al report a significant relationship between urine concentrations of BPA and cardiovascular disease, type 2 diabetes, and liver-enzyme abnormalities in a representative sample of the adult US population. This report, suggesting links between BPA and some of the most significant and economically burdensome human diseases. This compound mimics estradiol, one of the estrogen compounds that we rely on to regular our

endocrine/hormone systems. It can act to either amplify or to block estrogen effects in the body. We know that they also affect the Incretin hormone system that helps regulate body weight and fat retention. Think of the epidemic of childhood obesity! Recognize that young girls are menstruating at earlier ages than has ever been recorded since the introduction of these agents.

BisphenolA also is very hard on our antioxidant system. Oxidation is the removal of electrons from one molecule to another. Think of burning fuel; oxygen is removing electrons from whatever is being burnt. Our cells constantly burn fuel to create the energy necessary for life. Our anti-oxidant system repairs the collateral damage that happens to the structures involved. Think of rust in pipes, that's another example of oxidation. This compound also causes oxidation of the lipids in all of our cell membranes. If you've ever found a plastic bottle that's been left in the sun for a long time, you'll recall how a previously pliable plastic becomes hard, brittle and opaque. This is an example of lipid peroxidation as what happens to all of our cell membranes with oxidative stress.

Here's what is really a modern-day horror show; ALL of these compounds have been detected in the blood and urine of most US children and adults in representative samples drawn for research purposes. There are at least 100 other environmental contaminants that have also been detected in breast milk and umbilical cord blood.

Toxicity of chemicals has traditionally been looked at in terms of what is the total dose of exposure and duration of exposure. This approach has been used in science and medicine since the 16th century and has served us pretty well. It may not be adequate with these compounds however. A review of some more advanced concepts of biology is in order.

Samuel Hahnemann earned his MD degree in Germany in 1799. Through his career he developed a new way of looking at medicine that taught that exceedingly low doses of therapeutic agent ("drug") that cause similar symptoms can be used to treat and reverse those symptoms. Lower doses cause stronger effects. His theories don't fit well with what we know of modern medicine, it's hard for modern physicians to conceptualize how these theories work. But indisputably, they DO work. This concept is introduced to show that even exceedingly minute doses of chemical can have profound effects—the entire field of *Homeopathy* is based on this premise with great success. Hormones work in a similar manner. It doesn't take much of a drop in estrogen and progesterone to induce a woman's period. A little too much or too little thyroid hormone can mean the difference between a coma, obesity, dry skin or an uncontrolled rapid irregular heart rate.

These chemicals can leave trace residues at the appropriate concentration to *act as hormones*.

Further appreciation of the dangers of these compounds requires a little more of an update on the science involved.

Windows of vulnerability: In animal studies, even brief exposures to EDCs during critical developmental periods have produced direct health effects, as well as alteration in the response to future exposures. For example, although not a frank carcinogen, bisphenol A has been shown to increase animals' likelihood of developing breast cancer in response to subsequent estrogen exposure.

Low-dose effects: Although classic toxicology asserts, "the dose makes the poison," most hormonally active substances affect physiologic signaling mechanisms at extremely low doses, usually below those used in standard toxicology testing. Like their endogenous counterparts, many EDCs show nonlinear dose-response relationships, which make extrapolations from high-dose studies inaccurate.

Multigenerational effects: Many EDCs alter gene expression, producing heritable effects known as epigenetic changes, which can affect animal offspring three generations after a single exposure while in the uterus.

Chronic, mixed exposures: Unlike experimental animals, humans are exposed to a mixture of chemicals, some of which produce additive or synergistic effects.

Studies have been done on the safety and biological activity of these compounds. The results have been mixed in an unfortunately predictable manner: studies funded by the industry have shown no danger.

Independently funded studies have not been able to repeat these results. Unfortunately it's still an area in which there is no clear smoking gun because there is so much we don't understand about the long-term/very low-dose exposures and how they will affect *subsequent generations*. That's right. Remember the epigenetic changes? They don't alter the genes in a pure mutation, they alter the expression of the genes that can last up to three generations after an exposure.

An important caveat to remember is that God designed our organs to metabolize and eliminate the compounds HE designed. He's given us the intelligence to manipulate so many parts of our environment. We may have unwittingly opened a Pandora's Box of problems that won't be fully evident for several more generations. It all boils down to the old adage; "You can't fool (around with) Mother Nature (safely)"!

Go in Good Health!

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Resources

The Collaborative on Health and the Environment

Searchable database of chemicals and diseases (<http://database.healthandenvironment.org/index.cfm>).

Center for Science in the Public Interest's Nutrition Action Health Letter

List of resources about bisphenol A (<http://www.cspinet.org/nah/bpa.html#reducing>).

Greater Boston Physicians for Social Responsibility

Fact sheets for patients and physicians, including the Pediatric Environmental Health Toolkit

(<http://psr.igc.org/hhep.htm>).

Natural Resources Defense Council

Consumer guides and summaries of the science (<http://www.nrdc.org/health/>).

Women's Health & the Environment

Environmental health toolkit

(<http://www.womenshealthandenvironment.org/article.php?list=type&type=64>).

References

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<http://jama.ama-assn.org/cgi/content/full/300/11/1353>