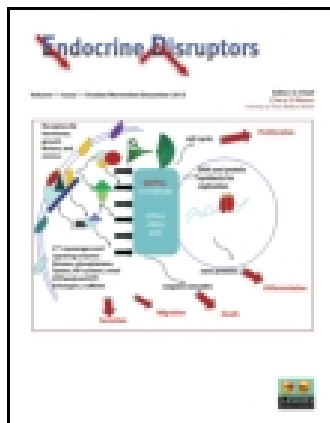


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Cross-training of biologists and chemists-new book entitled "Endocrine Disruptors in the Environment"

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Cross-training of biologists and chemists—new book entitled “Endocrine Disruptors in the Environment”

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A topic of particular interest to *Endocrine Disruptors* journal readers is communication and cross-training between biologists and chemists. Many of us view this as a mechanism for promoting green chemistry design, aimed at eliminating endocrine-disrupting chemicals from future consumer products and the environment. This intersection of fields, and the advice that comes from it, should be the basis for crafting public policy to prevent and remediate endocrine disruption. So in this context, Dr. Sushil Khetan has performed one of those formidable tasks that some of us talk about, and very few of us actually accomplish – the synthesis of materials from 2 divergent fields into a text that will prepare students at several levels to understand this present and growing societal health problem. Many modern synthesized chemicals used in the manufacture of consumer products mimic (though imperfectly) hormonal signaling normally controlled by our endogenous hormones. Disruptions caused by this imperfect mimicry can lead to developmental interruptions and negative outcomes including many chronic diseases that have their roots in early exposures. Yet some of these invented chemicals perform jobs that we are reluctant to do without (birth control pharmaceuticals, insecticides, plastics). Creative solutions to this modern dilemma can only come from bringing together the knowledge of 2 mostly distinct disciplines, synthetic chemistry and biology. Lessons learned from the juxtaposition and intermingling of knowledge in these fields will allow us to more intelligently train future thinkers, problem-solvers, practitioners, and regulators to grapple with the accidental synthetic chemical imitation of hormones.

Cross-learning the vocabulary and principles of these 2 disciplines is daunting for most of us, basically trained in our disciplinary silos. Though chemistry is part of the initial training for biologists, it is in our remote past, and we really are never schooled in the principles that guide the invention of new molecules. Chemists, likewise usually do not have a lot of training in

how their inventions might affect biological systems. So much is to be gained when 2 disciplines separately developed and taught over many decades, come together to consider the central tenants of each and how the interface affects important societal problems like this one. With this knowledge, biologists can tell chemists what molecules are misbehaving, and chemists can redesign them or devise ways to deconstruct them into harmless pieces once they have done their job.

This book begins with the essential points of the modern view of how hormones work, updating classical modes like genomic mechanisms for steroid hormone receptors and their family members with the more recent addition of non-classical rapid nongenomic signaling models. The book includes sections on the major classes of hormones disrupted (estrogens, androgens, thyroid hormone, and several metabolic/developmental targets) and explains how many modern post-industrial chemicals can mimic or interfere with the mechanisms of specific hormones. Also addressed are newly recognized principles and problems such as the nonmonotonic dose behavior of most compounds that act like hormones, the rather recent recognition of trans-generational effects of hormonal mimics, and the growing practical problem of how hormonal sensing systems deal with the mixtures of chemicals to which we are exposed. In part II, we learn of the major classes of EDCs and how they are biodegraded and bio-transformed. We are then taught about various “abiotic” approaches to efficiently mimic the usually enzymatic degradation of endocrine disruptors to harmless components. Finally, in Part III we learn about how we can screen for the actions of EDCs so that we can discover which ones are a problem (as new ones are being invented constantly), where they are contaminants, and how to assess the effectiveness of our cleanup programs. Various targets (receptors, signaling cascades, susceptible genes, enzymes, blood and DNA binding proteins) in specific cell types, biological tissues, and whole organisms are reviewed to describe the principles of their assay sensitivity and specificity, and their comprehensiveness. In addition, schemes to effectively combine assay tiers to detect harm at all susceptible levels are reviewed. Major environmental spaces and media are discussed to get us thinking about which human contact domains must be dealt with (water, soil, agricultural applications) and which aspects are most important to consider in regulating exposure of humans and animals, and in designing cleanups. In each segment, Dr. Khetan summarizes the current position of the science, where it needs to go to be more effective, and promising leads in that direction.

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The final chapter is the most hopeful one. It assures us that these problems have been recognized by forward thinking and currently interacting chemists and biologists. Cross-fertilization has begun and has created the field of “green” chemistry. This new meld of investigation and design is yielding solutions at multiple levels: chemical invention practices, comprehensive screening, remediation, and cross-training of future biologists and chemists. This book is a great resource for those wanting an

overview of this grand collaborative enterprise, or for those preparing the next generation for investigating, problem-solving, and managing our bio-chemical future, giving us a chance to balance modern living with safety.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.