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Safer by Design

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Achieving the goal of designing safer chemicals seems to range from the scientifically straight-forward to the conceptually near-impossible. On the one hand, it is easy to understand how molecules can have their structures and properties manipulated to decrease their bioavailability or to increase their degradability in the environment, or to be less corrosive, or to be non-explosive.

Using our current molecular level of knowledge and our currently available tools, many of these challenges can be addressed.

On the other end of the spectrum of challenges associated with designing safer chemicals, the complexity of the interconnected biological mechanisms of action that underlie the plethora of toxicity endpoints can seem scientifically daunting.

While it is recognized as difficult to design molecules for even a single therapeutic endpoint when developing a new pharmaceutical, the challenge becomes increasingly complicated when trying to design molecules to address toxicity endpoints ranging from carcinogenicity to endocrine disruption to reproductive/developmental toxicity to acute lethality.

Designing a molecule that avoids one type of toxic mechanism of action without increasing the likelihood of initiating any of the others is no small feat. It also happens to be the challenge that we must address as chemists. This collection of papers demonstrates the potential and promise of realizing this urgent and important goal. Good thing that green chemists didn't go into this field because it was easy.

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