

Community Spotlight

Harold I. Zeliger, PhD



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Please tell us about yourself.

I have a Ph.D. in organic chemistry and am a Board Certified Forensic Examiner in the areas of chemical toxicology and chemical fires and explosions. I have forty five years experience as a researcher and consultant in the field of chemical toxicology in both academic and industrial settings. I have published more than fifty technical publications including pioneering studies on the toxicology of chemical mixtures and the newly published book, *“Human Toxicology of Chemical Mixtures”*. In addition to my ongoing research, I work as a consultant in the areas of chemical toxicology, chemical accident investigation, environmental pollution and chemical product design. I have served as an expert witness in numerous chemical exposure court cases.

Why did you initially become involved in toxic tort consultation?

I originally became involved in consulting on toxic tort cases after my work on designing warning labels. I wrote material safety data sheets for hazardous chemical products when they first became required back in the 1970s. I studied chemical toxicology so that I could properly prepare this warning material. Following

some publications on the subject, I found myself consulting and giving lectures to industry groups about the proper preparation of warning material and the underlying chemical toxicology. Soon, some of the inquiries were from attorneys in the field of toxic tort litigation and my work in this area began.

When did you first discover the consequences of chemical combinations?

Over the course of approximately thirty years, I received numerous inquiries regarding injuries and illnesses resulting from exposures to chemical mixtures. During this time period, a reading of the scientific and medical literature did not predict the effects observed from the toxicology of the individual chemicals comprising these mixtures. I concluded that the injuries and illnesses were not related to the chemicals identified, but that other factors were involved. The large number of such inquiries, however, led me to think that perhaps there was a mixture effect. I reviewed my records hoping to find a common thread, but none appeared. The breakthrough came after I investigated two mixture exposures around the same time, one a “sick building” incident and the other a pesticide application incident. In each case, people inhaled volatile organic chemicals at concentration

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levels less than one tenth of those known to be toxic for the individual chemicals, yet they suffered severe respiratory impacts. Upon examining the chemical makeup of two different exposures, I found that each contained both hydrophilic (water soluble) and lipophilic (oil soluble) components. A review of my records indicated that each of the previous toxic tort inquiries was for a combination containing both hydrophiles and lipophiles. A thorough search of the medical and toxicological literature confirmed my discovery.

You published studies in 2003 and 2004 with findings of enhanced acute and chronic responses, low-level concentration response, unexpected target organ attack, and cancer clusters as a result of chemical mixtures. Would you elaborate on what this means?

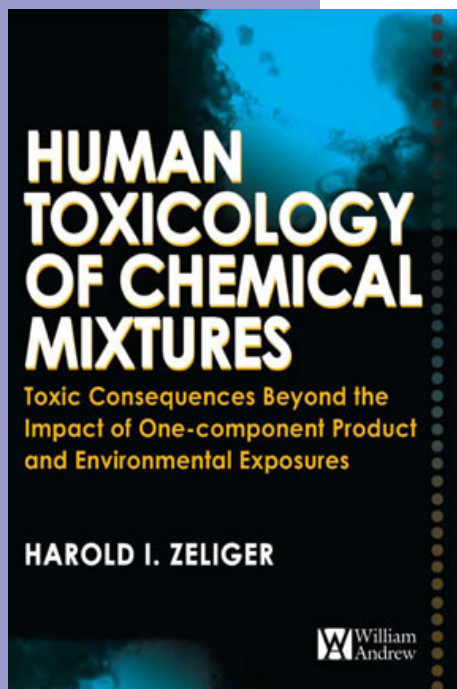
Exposures to mixtures of chemicals that contain at least one lipophile and one hydrophile can produce unexpected effects. It is hypothesized that the lipophiles facilitate the absorption of the hydrophiles across the body's protective mucous membranes and that together each of these mixtures produces effects that are different from the effects one would expect to observe following exposure to the individual hydrophilic and lipophilic components. This unique interaction makes it difficult to predict how a particular mixture

will affect an exposed person.

The effects of mixture exposure include severe acute (short response time) and chronic (long term) reactions where none are predicted from a consideration of the individual species. The effects also include attacks on organs and systems not known to be affected by the single chemicals. The unexpected organ attacks include many cancers that are not attributable to the individual chemicals. The previously unanticipated effects of mixtures occur in respiratory, circulatory, nervous, reproductive, immune, gastro-intestinal and filtering (liver, kidneys and urinary tract) organs. The low-level effects, i.e., reactions to concentrations far below those expected for the individual chemicals, are particularly evident in those with Multiple Chemical Sensitivity (MCS), Chronic Fatigue Syndrome (CFS), Fibromyalgia (FM) and Gulf War Syndrome (GWS).

What encouraged you to write your new book, "Human Toxicology of Chemical Mixtures"?

Following the 2003 and 2004 publications I was contacted by scientists and physicians who had questions about specific mixtures and mechanisms for the action of mixtures. I had been thinking about writing the book as a way to respond those inquiries, when I was contacted by William Andrew about writing one. By the time of that contact, I had read hundreds of publications, begun my study of molecular toxicology and gathered enough material to start writing the book. It is my hope that the book will stimulate additional research and provide explanations to patients suffering from diseases that are caused by these complex interactions.



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How does your discovery of the toxic nature of chemical mixtures impact future toxic tort litigation?

Discussions with attorneys have indicated that my discovery’s impact on toxic tort litigation could be enormous. I have already given testimony in several mixture exposure cases and have received inquiries regarding presentations at bar association meetings.

Would you summarize the chapters on sick building syndrome (SBS), multiple chemical sensitivity (MCS), fibromyalgia (FM), chronic fatigue syndrome (CFS), and Gulf War syndrome (GWS) and how you think chemical connections are involved?

SBS as now used connotes mucous membrane irritation (primarily nose throat and eye); sensory irritation (primarily odor); skin irritation; and respiratory discomfort. SBS may have biological (mold and mildew) and/or chemical triggers. Chemical agents that contribute to SBS come from carpeting, paint, furniture, adhesives,

than the general public and may suffer more severe symptoms.

When the causes of “sick buildings” are due to chemicals, the chemicals almost invariably contain mixtures of lipophilic and hydrophilic species that alone are not problematic.

Individuals with MCS, also referred to as chemical intolerance, are those who react adversely to low levels of chemicals that are tolerated by the general public. People with CFS, FM and GWS often react to chemical exposures in a manner similar to those with MCS. Though the causes of all these conditions are as yet unknown, there is strong suggestive and experimental evidence that exposures to mixtures of lipophiles and hydrophiles can serve as triggers for them.

A large percentage of people with CFS, FM and GWS also suffer from MCS. All these conditions have immune, nervous and endocrine system manifestations. Chemicals that target these systems (of which there are hundreds of individual species and incalculable numbers of mixtures) can initiate symptoms. Much, however, still remains to be learned.

Symptoms of MCS are reversible upon withdrawal of the stimuli, whereas CFS, FM, and GWS do not readily resolve when the stimuli are withdrawn. Clearly, individuals with any of these conditions should limit their exposure to volatile chemicals and particularly to mixtures. Such avoidance is extremely difficult, given the hundreds of volatile toxic chemicals that are present in the air we breathe, the water we drink, the food we eat, and the places in which we live and work.



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What can the occupational worker and average consumer do to protect themselves?

Workers are offered limited protection by the Occupational Safety and Health Administration (OSHA) regulations requiring that employers provide protective equipment and safety training to those who use chemicals on the job. Regretfully, the OSHA requirements for exposure limits only address individual chemicals and not mixtures when exposure limits are set. To be properly protected, workers should wear appropriate clothing, gloves, eye wear, and respirators capable of eliminating inhalation of toxic chemicals. They should never handle chemicals with bare skin, nor should they continue to work if they become symptomatic in any way. Odor thresholds for most volatile chemicals are far below toxic levels, but not below levels that in mixtures cause adverse health effects. Accordingly, the presence of a chemical odor should serve notice that greater protection is needed.

Consumers are offered some protection by the Federal Hazardous Substances Act (FHSA) which sets standards for warnings that must be contained on the labels of hazardous chemical products. The FHSA is administered by the Consumer Product Safety Commission (CPSC), but regrettably, the CPSC is not required to monitor warning content. This failure to monitor results in the marketing of chemical products that fail to adequately warn the user of the hazards associated with these products. The consumer can ask the retailers where

they purchase chemical products for material safety data sheets (MSDS), which generally contain much more elaborate warnings than labels do. Consumers should read and understand the warnings prior to using these products. Here too, however, the warnings regarding mixtures are rarely given. To properly protect themselves, consumers should use proper skin and respiratory protection when using chemical products; stop using them and leave the areas where they are working if they in any way feel symptomatic; and *never* mix two chemical products together unless specifically instructed to do so by the products' warning labels.

Where may interested individuals get more information read and/or purchase your book?

Interested individuals can learn more about my work, read examples of chemical exposure investigations or contact me on my web site, www.zeliger.com.

More information about the book is available by clicking on the following link to the publisher's announcement. This link provides an introduction to the book and a table of contents listing its 36 chapters.

<http://tinyurl.com/3werjz>

The book can be purchased directly from the publisher, William Andrew, or from on-line book sellers such as Amazon, Barnes and Noble or Borders. ISBN: 978-0-8155-1589-0

Editors Disclosure: MCS America has no financial interest in the sale of this book.

