



POSITION STATEMENT*

*Statements created after 2011 are dubbed Issue Statements.

Toxicologic Principles Do Not Support the Banning of Chlorine

Adopted by the Society in 1994; Originally published in 1995; Reviewed by the SOT Occupational and Public Health Specialty Section and the SOT Risk Assessment Specialty Section leadership in 2015

Proposals have been made to develop a national strategy for substituting, reducing, or prohibiting the use of chlorine and chlorine-containing compounds based on the premise that such action would improve protection of human health and the environment (International Joint Commission, 1994; US Environmental Protection Agency, 1994). The Council of the Society of Toxicology (SOT), the governing body of the Society, views these proposals as being contradictory to the principles on which the science of toxicology is based.

The SOT is a professional organization composed of scientists (almost 5,000) from academia, government, non-governmental organizations and industry who are engaged in various areas of toxicology. The toxicologist is specially trained to examine the nature of the adverse effects of chemical and physical agents on living organisms and the chemical and physical agents on living organisms and the environment. Toxicologists investigate the mechanism of action on the agent under consideration and assess its potential to cause adverse effects.

The literal definition of toxicology the study of poisons is somewhat simplistic in that it implies that we know which substances are toxic and which are not. In fact, a truism that has endured for about 500 years is that essentially every chemical, either alone or in combination with other chemicals—in sufficient doses—is capable of producing an adverse effect. In more familiar terms, the dose makes the poison. Chemicals may have beneficial effects at some doses and adverse effects at others. A responsibility of the toxicologist is to define the potential toxic effects that chemicals can induce and to determine the conditions of use that minimize or prevent these effects so that the beneficial attributes of chemicals can be realized safely.

Some chlorinated compounds may present a justifiable health concern and indeed, some (e.g., DDT) have been banned. However, a comprehensive strategy to eliminate a class of chemicals containing a common element (e.g., chlorine) is simplistic and ignores the basic principles of toxicology that govern risk assessment. In addition, it is important to note that elimination of

www.toxicology.org

 www.facebook.com/societyoftoxicology

 [@SOTToxicology](https://twitter.com/SOTToxicology)

"Toxicologic Principles Do Not Support the Banning of Chlorine" SOT Position Statement

chlorine from the environment would be impossible because there are many naturally occurring chlorine-containing chemicals (including sodium chloride). The number of such that have been identified that has expanded markedly in the past decade, e.g., 30 naturally occurring chlorinated chemicals had been identified in 1968 compared with 1500 in 1992 (Willes et al., 1993).

We should continue to conduct research to identify the potential for chemicals to damage the environment and /or endanger human health, ideally before they are released. The risk from a chemical exposure can be predicted realistically only if there is adequate information about the intrinsic toxicity of the chemical (including dose-response data), the potential for exposure and the capacity for the chemical to bioaccumulate and persist in the environment. Chlorinated chemicals not only differ substantially in their toxic potencies, but they also differ in their propensities to bioaccumulate and persist in the environment. Thus, the mere presence of an element, e.g., chlorine, does not automatically impart harmful properties to a chemical.

All chlorine-containing compounds are not equally hazardous. Therefore, SOT takes the position that a broad-based ban of the class of chemicals containing chlorine, or any other element for that matter, would be both irresponsible and unscientific. Such a prohibition would unnecessarily eliminate many beneficial chemicals from common use. For example, the chlorination of drinking water in the vast majority of US water systems has prevented untold numbers of illnesses and deaths by killing pathogenic organisms found in the water supply. The formation of low levels of potentially toxic chlorinate compounds as a result of this process is certainly of concern and must be minimized.

However, the estimate hazard posed by the trace amounts of these materials that are produced is insignificant compared with that from untreated water. Accordingly, the benefit of a chlorinated water supply vastly outweighs its estimated risks. Other essential uses for chlorinated compounds include hospital disinfection, plant protection and the production of countless consumer products, including pharmaceuticals and plastics. Therefore, before a ban of chlorinated compounds (or a marked reduction of their use) can be considered in realistic context, the feasibility of producing effective and less toxic substitutes must be demonstrated. The concern surrounding the use of chlorine and chlorine-containing compounds is related at least in part to the large amount of information that has been generated by research on the toxicities of some of the compounds in this class. However, a similar body of evidence does not exist (i.e., the studies have not been performed) for most alternative compounds. Thus, before changes are made, the consequences of elimination of a compound or the hazard of using another chemical to achieve the same end must be considered.

www.toxicology.org

 www.facebook.com/societyoftoxicology

 [@SOToxicology](https://twitter.com/SOToxicology)

“Toxicologic Principles Do Not Support the Banning of Chlorine” SOT Position Statement

The Society of Toxicology supports a comprehensive objective approach to understanding the potential hazards of chlorine and chlorine-containing compounds. It recognizes that there is a substantial body of evidence that implicates some of these compounds as potential human and environmental hazards. It is also aware that other, non-chlorinated, chemicals have a similar or greater potential to cause harm. Consequently, the SOT takes the position that the most responsible and scientifically sound approach is to assess the toxicity of agents on a chemical by chemical basis, rather than target one class of chemicals (e.g., chlorine-containing compounds) for study and elimination. The determination of unacceptability should be based on scientific data that document the adverse effects of exposure and a weighing of the risks vs. benefits of using the chemical in question. Indeed, based upon sound principles of toxicology, rational and effective assessments of the potential toxicity of chemicals, including chlorinated chemicals, are currently taking place and rigid standards exist for registration of new products to which people will be exposed.

References

International Joint Commission on the Great Lakes, Durnil, G. K., Lanthirt, C., Cleveland, H. P., Goodwin, R. F., Macaulay, J. A. and Walker, G. W. (Commissioners) (1994). Seventh Biennial Report on Great Lakes Water Quality, Windsor, Ontario, Canada, February 1994.

US Environmental Protection Agency’s 1994 Recommendations in the Pollution Discharge Prohibitions of the Clean Water Act Reauthorization, as Transmitted to the Congress by the Executive Office, p.22, February 1994, EPA 800-R-94-001.

Willes, R. F., Nestmann, E. R., Miller, P. A., Orr, J. C. and Munro, I. C. (1993). Scientific principles for evaluation the potential for adverse effects from chlorinated organic chemicals in the environment. *Regul. Toxicol. Pharmacol.* 18, 313–356.

“Toxicologic Principles Do Not Support the Banning of Chlorine: A Society of Toxicology Position Paper.” *Fundamental and Applied Toxicology.* Karol, M. H.¹ (1995). 24.²⁻³

¹ *President, Society of Toxicology*

² *This document was prepared in consultation with the SOT ad hoc Chlorine Working Group. Members of the group were J. P. Kehrer (SOT Mechanisms Specialty Section), J. C. Lamb (SOT Regulatory Affairs and Legislative Assistance Committee), J. A. Moore (SOT Risk Assessment Specialty Section), J. Zurlo (SOT Committee on Public Communications) and J. I. Goodman, Chair (SOT Council Liaison to the Specialty Sections).*

“Toxicologic Principles Do Not Support the Banning of Chlorine” SOT Position Statement

³ *Affiliations: J. P. K., Division of Pharmacology and Toxicology, University of Texas at Austin, TX; J. C. L., Jellinek, Schwartz & Connolly, Inc., Washington, DC; J. A. M., Institute for Evaluation Health Risks, Washington, DC; J. Z., Department of Environmental Sciences, Johns Hopkins University, Baltimore, MD; J. I. G., Department of Pharmacology and Toxicology, Michigan State University, East Lansing, MI; M. H. K., Department of Environmental and Occupational Health, University of Pittsburgh, Pittsburgh, PA.*

www.toxicology.org

 www.facebook.com/societyoftoxicology

 [@SOToxicology](https://twitter.com/SOToxicology)