

Setting the Standard

Evaluating the effects of pool treatment chemicals

The development and use of pool treatment chemicals has enabled swimming to become widely enjoyed. In the United States alone, there are over 10 million residential pools, and more than 360 million people visit 250,000 public swimming pools annually. While the primary focus for recreational water regulators and researchers has been hygiene and water quality (particularly on preventing infections caused by microbes and protozoa), new concerns have been raised regarding potential adverse health effects resulting from exposure to chemicals used in the treatment of swimming pools and spas.

In 2011, public officials made a presentation to the NSF/ANSI 60 Recreational Water Facility Joint Committee (RWFJC)¹ about their concerns with treatment chemicals used in the pool and spa industry. The presentation centered on the use of chemicals that have not undergone any form of health effects evaluation or certification. Although a few types of pool and spa chemicals

undergo a form of third-party review (typically certification under *NSF/ANSI 60*), the officials noted that they had no readily available mechanism to properly evaluate the health risks of the treatment chemicals. Based on this presentation, the RWFJC appointed a task group to develop a methodology for evaluating the toxicity of chemicals used in pools and spas.

Since its first meeting in 2012, the group has examined various approaches toward evaluating chemical toxicity, including evaluation under *NSF/ANSI 60*, as well as methods used by the U.S. Environmental Protection Agency Office of Pesticide Programs. It was determined that *NSF/ANSI 60* does not adequately address health effects that may be associated with dermal and inhalation exposures occurring from pool/spa uses, since only oral exposure is considered in the language. Additionally, the chemical limits of *NSF/ANSI 60* are intended for drinking water, based on a consumption rate of two liters per day, which greatly exceeds expected oral exposure from pool

or spa use, and which may exclude pool chemicals that are safe to use. In order to address some of the deficiencies in using *NSF/ANSI 60* to assess swimming pool treatment chemicals, the RWFJC task group contacted the EPA Office of Pesticide Programs and was given a presentation on the methods used by the EPA in the evaluation of swimming pool antimicrobial products. Part of the method included various assumptions and equations that may be used to estimate dermal, oral and inhalation exposure to chemicals dosed into the pool water.

The RWFJC task group identified several challenges to the evaluation of the toxicity of pool treatment chemicals, including how to address by-products produced through the reaction of the treatment chemical with other constituents of the treated pool water, as well as the potential accumulation of a treatment chemical or contaminants in the pool water due to multiple dosages over time. These challenges are compounded by the variability of pool-specific parameters,

including individual pool water chemistry, recirculation rates, filtration rates/types, water replacement and splash-out rates. With the goal of developing a toxicological review process for chemicals that is both effective and timely, the RWFJC currently is considering a simplified approach.

The proposed toxicology evaluation procedure borrows heavily from pool treatment chemical exposure approaches used by the EPA, as well as the toxicological evaluation procedures in Annex A of both *NSF/ANSI 60* and *61*. The proposed procedure is outlined below but, as a draft, it is subject to change:

➤ The pool chemical manufacturer must provide detailed product formulation information that allows for the identification of all unique chemical components of the product, as well as the concentrations of each component. Additionally, the maximum

recommended dose rate of the product must be provided.

- Based on the formulation information and label or use instructions, the concentration of each swimming pool treatment chemical (or contaminant) in the swimming pool water following dosing at the maximum recommended dose rate is then calculated.
- As an initial toxicity screening evaluation, any chemical constituent (or contaminant) in the product formulation that has a concentration in the swimming pool water of $\leq 10 \mu\text{g/L}$ when dosed at the maximum recommended dose does not require further toxicological evaluation. This threshold value does not apply to any substance for which available toxicity data and sound scientific judgment indicate a significantly increased risk for an adverse

health effect at a swimming pool water concentration at or below $10 \mu\text{g/L}$.

- For chemical constituents (or contaminants) with concentrations in the swimming pool water that exceed $10 \mu\text{g/L}$ at or below the maximum recommended dose, an exposure assessment is then performed utilizing the exposure assumptions and equations obtained from the U.S. EPA Office of Pesticide Programs. The exposure assessment accounts for oral, dermal and inhalation routes of exposure.
- Following the determination of exposure levels for the chemical constituents (or contaminants), the acceptability of such exposure levels may be evaluated by using a published peer-reviewed risk assessment value for the specific chemical in question or a risk assessment may be conducted by

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The proposed toxicology evaluation procedure borrows heavily from swimming pool treatment chemical exposure approaches used by the EPA, as well as the toxicological evaluation procedures set forth in Annex A of both NSF/ANSI 60 and 61.

the reviewing toxicologist utilizing an approach similar to the method set forth in Annex A of both *NSF/ANSI 60* and *61*.

It is the intent of the RWFJC task group to present a draft toxicology evaluation procedure to the NSF/ANSI 50 Recreational Water Facility Joint Committee at the 2014 annual meeting in September. Additionally, a draft procedure will be presented to the NSF Health Advisory Board² for consideration and feedback. Following the incorporation of any recommendations from those two groups, the procedure will be balloted for addition to *NSF/ANSI 50*.

While the current focus of the RWFJC task group concerns methodology to assess the toxicity of individual chemicals, future work includes establishing methods for chemical dosing and leachate extraction testing. Another future endeavor of the group is to develop methods for the

assessment of performance claims of pool treatment chemicals. Lastly, the task group intends to investigate methods to assess the safety of pool/spa chemicals being used in conjunction with other chemicals.

If you are interested in participating in the NSF/ANSI 50 Recreational Water Facilities Joint Committee Task Group on Chemicals and Materials, please contact Mindy Costello at mcostello@nsf.org for more information. ■

1 The RWFJC is composed of three equal voting membership groups of 11 persons each, representing the following sectors: public health (such as the CDC and state and county public health inspectors and administrators), product manufacturers (such as makers of pumps, filters, UV systems, etc.) and end users (such as facility designers, facility operators, trade association members, etc.).

2 The NSF HAB is composed of expert toxicologists and risk assessors from government, academia and industry. Membership includes representatives from the EPA, Health Canada and the University of Michigan School of Public Health.

Written by the NSF International Toxicology Services Department

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