



American Cleaning Institute

Development of Exposure Assessments Methodology

The American Cleaning Institute (ACI) has developed the Cleaning Product Ingredient Safety Initiative (CPISI) as one of its many efforts to promote the responsible management of cleaning products and their ingredients. The first step in this initiative was to compile and make publicly available a comprehensive inventory of ingredients used among its members in the formulation of home use consumer cleaning products sold in the United States. ACI released this [Ingredient Inventory](#) in August 2012. The next step in the project was to identify publicly available human health hazard data relevant to each ingredient that was identified in the inventory. ACI released the [Hazard Data Portal](#) in 2013.

For this phase of the initiative, ACI has developed the exposure estimates associated with the use(s) of each of ingredient listed in the Ingredient Inventory as part of a consolidated Development of Exposure Assessments Inventory. This information sheet summarizes how the models were identified.

Goal of developing exposure assessments

The goal of this phase of the CPISI was to characterize the exposure for each ingredient, in the framework of the product types and their typical applications. The planned approach was an extension of that undertaken by ACI (as the then Soap and Detergent Association), and published in the peer-reviewed literature in 2006 (Sanderson et al., 2006). Exposure modeling focused on the products examined in CPISI Phase 1, their chemical composition (as described by the Phase 1 Product Inventory), their intended uses, and data from surveys of habits and practices for the use of these products.

Types of data collected

The information available at the above described sources included (but was not limited to):

- Product types in which each ingredient is used (e.g., all purpose cleaner-liquid, laundry detergent-powder).
- Function of each ingredient (e.g., solvent, humectant, surfactant, chelating agent).
- Habits and practices for typical and intended use of each cleaning product containing the ingredients evaluated in the CPISI.

Sources of data for exposure assessments

A variety of sources were used to acquire the necessary ingredient/product type information and exposure pathway information needed to successfully develop an exposure estimate(s) for each ingredient. Data on products types containing each ingredient, ingredient function, and concentration range in each product type were collected from company websites (where available) during the development of the Ingredient Inventory. Where gaps existed, ingredient function was found on company websites (where available) or by searching online databases including the U.S. Environmental Protection Agency's Design for Environment (DfE) database, and the GreenBlue Institute's CleanGredients database. In the absence of company information, the DfE database was determined to be the most comprehensive; as such, this was the first source utilized when assigning a function to each ingredient. If a function was not listed in the DfE database for a particular ingredient, other lists of functional classes such as the CleanGredients list or the High Production Volume (HPV) submissions were used. Additionally, ACI Consumer Specialty Products Association (CSPA) and the Personal Care Products Council (PCPC) have identified functional use classes for a large number of cleaning product ingredients and these sources were utilized as well.

Once an ingredients function had been determined, this information was used to develop concentration ranges for each ingredient in the product types in which it is found. Concentration data was pulled from company information sheets or MSDS for ingredients where available. Additionally, data on the habits and practices for typical and intended use of cleaning products (from Sanderson et al. 2006) were used to determine concentration ranges and typical exposure pathways and models for product types and forms (e.g. all purpose cleaner, spray).

Data collection process

Product types, function, and concentration

Ingredient and product information collected during the first phase of the CPISI was revisited to gather the connections between ingredients and product types and to pull any information collected on concentration ranges for each ingredient. Ingredients with no primary concentration data were then compared to established lists of functional classes from the sources described above to identify concentration ranges. Examples of these classes include chelating agents, surfactants, and solvents. If none of the resources described above could be used to assign a class, the chemical groupings assigned during Phase 1 were reviewed. Functions assigned to other ingredients within a group were reviewed and a determination made as to whether it applies to the ingredient in the same grouping. After functional classes were compiled, the list was standardized to the Organisation for Economic Co-operation and Development (OECD) nomenclature for ingredient functions. In some cases, concentration data accompanied information which couples an ingredient to its respective function; in these cases, the concentration ranges were collected for ingredients.

Designation of exposure models

The data described above was used to determine the ways in which a user could potentially be exposed to a particular ingredient as a result of intended use of the product. Exposure is dependent on the type of cleaning product being used as well as the ingredient's concentration in

the product. Each product type under the scope of the CPISI has a specific application which is expected to cause exposure through one or more of the traditional routes (inhalation, ingestion, dermal). Previous work has connected these product applications with consumer habits and practices, exposure pathways and model equations to characterize estimated intake. This previous work was used in this phase to connect each ingredient to its relevant routes and models of exposure. These exposure equations, generated under regulatory and risk assessment paradigms in the US, were gathered and published by ACI (Sanderson et al., 2006). Based on the typical use patterns for the products that fall under the scope of this project, 16 possible exposure models were applied.

Execution of exposure models

The successful gathering and curation of the exposure model data allowed for calculation of estimated exposure for each ingredient for each route using the equations from Sanderson et al., 2006. The completion of these exposure models generated estimates of exposure for individual routes of exposure under normal and intended use of the cleaning products under the scope of the CPISI. These exposure estimates were calculated as mg/kg/day. When individual ingredients were used in more than one product type, aggregate exposure estimates to each ingredient were generated by summing the single-route values. These values were identified as arising from multiple product exposures.

Relevance to the long-term goal of the CPISI

Identification of the exposure models for each cleaning product supports the long term goal of the project to conduct screening-level risk assessment to describe the safe use of every ingredient. Using the human health hazard data (collected during the second phase of the CPISI) and exposure information, ACI seeks to conduct a screening level risk assessment and to publicly report the margin of exposure (MOE) for each application resulting from long-term exposure to each cleaning product ingredient.