

## **Integrating Hazard Characterization Approaches for Evaluating the Potential of Consumer Products to Cause Asthma**

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Concerns have been raised regarding the potential for consumer products, including cleaning products to cause or exacerbate asthma or asthma-like responses. Although many forms of asthma are inflammation-based, some low-molecular-weight chemicals have been shown to trigger immunoglobulin E (IgE) independent occupational asthma. Single exposures to high concentrations of chemical irritants are also known to elicit an asthma-like response: reactive airways dysfunction syndrome (RADS). RADS can occur within hours of the initial exposure and may continue, as non-specific bronchial hyper-responsiveness, for extended durations. Exposure to irritants may be a trigger for respiratory symptoms in individuals with pre-existing asthma. Current methods cannot adequately assess the potential for consumer product ingredients to trigger asthma or asthma-like responses; epidemiological studies can only measure possible effects associated with a multitude of chemicals and products, and no single animal model can reliably replicate the complexity of an asthma-like response in humans. In order to characterize asthma and respiratory related hazards associated with consumer products, a decision system is needed that incorporates existing guidance, frameworks, and models. To develop such a tool, we compiled and evaluated *in vivo*, *in vitro*, and *in silico* methods that may provide data, or insight, to predict potential asthma or asthma-like responses (e.g., respiratory sensitization) and noted strengths and weaknesses associated with each method. We collaborated with asthma research experts to refine our findings and approach. Despite the wealth of information on asthma, current guidelines, bioassays, and computer models cannot definitively identify whether a particular ingredient, or chemical, causes or exacerbates asthma or asthma-like responses. However, possible predictors of allergy-induced asthma, such as respiratory sensitization, are useful to assess the likelihood that a particular chemical, ingredient, or product may be associated with asthma induction.