Characterizing Acute Inhalation Toxicity using an In Vitro Human Airway Model

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An alternative method that can accurately predict inhalation toxicity categories without the use of animals would significantly reduce animal testing while continuing to protect human health. In a previous study, three formulated pesticide products were evaluated using the EpiAirway™ in vitro human airway model with exposure via the cell culture medium. The results were compared with previous acute in vivo inhalation studies. Evaluation of irritation potential and tissue damage were determined by measuring transepithelial electrical resistance (TEER), lactate dehydrogenase (LDH) release, resazurin metabolism, and histopathology. The results suggested the TEER endpoint was the most sensitive enzymatic indicator of toxicity. Importantly, the histopathology assessment correctly categorized the formulations as having high, moderate, or low inhalation toxicity. The current project will quantify dose response of 10 formulated products. The results will be compared to existing in vivo inhalation hazard classification for these 10 formulated products to assess the ability of this in vitro assay to correctly categorize inhalation toxicity.

Implications: New approach methods, such as this in vitro human airway model, hold considerable promise for improving the efficiency and relevance of safety assessment evaluations, and at the same time to reduce testing in laboratory animals. This study will contribute to the understanding of the performance of this respiratory tract toxicity model and provide data that can be used to inform the model's use in product stewardship and regulatory decision making.

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