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**Vickie R. Walker<sup>1</sup>, Charles P. Schmitt<sup>1</sup>, Artur J. Nowak<sup>2</sup>, Iga Czyz<sup>2</sup>, Jennifer Black<sup>3</sup>, Vidhi Verma<sup>3</sup>, Debbie Peek<sup>3</sup>, Kelly A. Shipkowski<sup>1</sup>, Andrew A. Rooney<sup>1</sup>**

1. Division of Translational Toxicology (DTT), National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH), Research Triangle Park, NC, USA
2. Evidence Prime Inc, Krakow, Poland
3. ICF, Reston, VA, USA

### **Advancing Environmental Health Evaluations: Leveraging Evidence Informatics for Efficient and Reliable Data Extraction**

**Abstract:** Assessing risk from exposure to environmental chemicals is critical for safeguarding human health. Systematic reviews (SRs) are the gold standard for evaluating health effects data because they minimize bias and enhance transparency. However, these methods are time-consuming, labor-intensive, and best suited for narrow research questions. Systematic evidence maps (SEMs) are a more flexible approach that employ SR methodologies to provide a comprehensive overview of broad or complex topics. SEMs categorize key concepts (e.g., exposure, health effect, study design) and visually display the extent and types of evidence, supporting synthesis and informed decisions on future research directions or regulatory assessments. Automated tools are needed to streamline workflows while maintaining high standards. Dextr was developed to assist in data extraction from complex environmental health literature. Dextr's human-in-the-loop, automated approach includes custom deep NLP models and LLM-based extraction with a 47% reduction in completion time, achieving high precision rates (93.2% AI-assisted/ 92.5% manual), with slightly lower recall (83.8% AI-assisted/ 91.8% manual). Our work shows Dextr's ability to address complex environmental health literature assessments, highlighting usability, enhanced model features, and functionality. A case study using Dextr to comprehensively map health effects evidence from tens of thousands of organohalogen flame retardants illustrates the effectiveness of automation with user verification in the data extraction process. This study underscores how Dextr can be integrated into SR processes to improve efficiency and facilitate data extraction, reducing time required and increasing the amount of information extracted to support decision making. The findings suggest that Dextr, leveraging advancements in AI technology, offers substantial benefits for the literature-based evaluation process, ensuring quality and reproducibility while reducing the time and effort required for environmental health assessments.

**Keywords:** crop stress sensing, early virus detection, portable spectrometer, hyperspectral sensor, multispectral sensor, remotely piloted aircraft system (RPAS)