

## A Prototype AI-Powered Screening Level Dermal Occupational Exposure Assessment Tool

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Exposure assessments for existing chemicals under the Toxic Substances Control Act (TSCA) are often constrained by inconsistent use of overly conservative default parameters and subjective decision-making, which reduces reproducibility and can inflate exposure estimates. To address these challenges, a prototype AI-powered dermal occupational exposure assessment tool will be developed to support transparent and reproducible human health risk evaluation workflows under TSCA.

- This prototype will integrate a large language model (LLM) as a cognitive layer to the system, to assist in transforming unstructured user and chemical data into structured model inputs, engaging users through targeted queries, and generating standardized documentation of decisions and outputs.
- The LLM will operate within a constrained retrieval-augmented generation (RAG) knowledge base to support context-aware, traceable responses.
- Machine learning classifiers trained on curated case study data will map conditions of use (COU) descriptions to appropriate occupational exposure scenarios to inform model selection and implementation.
- Transparent decision tree logic will also be developed and used to govern the exposure scenario determinations and consistent parameterization of dermal exposure inputs.
- EPA's command-line compatible exposure modeling tool (i.e., EPA's Command Line Occupational Exposure Tool (CLOET)) will be incorporated to enable automated model execution.
- Additionally, quantitative structure-activity relationship (QSAR) models will be utilized to fill physicochemical property data gaps where needed.

The prototype will be provided as a functional web-based user interface and the system will be validated against test cases to confirm reliability and reproducibility. The resulting web-based tool will allow users to understand when the generation of additional dermal exposure data would reduce uncertainties in the exposure assessment and help avoid unnecessary risk management decisions. Moreover, the prototype will support the application of exposure controls, whether engineering controls, administrative controls, or use of personal protective equipment, to reduce workplace dermal exposures and mitigate potential risks.

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