

Title: Development of an easy-to-use, semantic technology-based knowledgebase containing toxicological information of cosmetic ingredients to assist animal-free risk assessment

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Background and Objectives: Currently, there are no validated animal-free replacement methods to assess repeated dose toxicity. This poses severe problems for developing new chemical compounds across various sectors, mainly cosmetics, where animal testing is entirely banned in the EU. However, since biological responses in an animal cannot be reflected using single non-animal methods, it is necessary to combine them into Integrated Approaches to Testing and Assessment (IATA) that rely on an integrated analysis of existing information coupled with the generation of new information using non-testing (e.g., grouping and read-across) and testing methods (e.g., *in vitro*). This study aimed to develop an easy-to-use, semantic technology-based knowledge base (KB) in which existing safety data of cosmetic ingredients can be gathered and maintained to assist non-animal systemic toxicity assessment.

Material and methods: As a first data set to create the KB, 93 opinions (PDF format) issued by the Scientific Committee on Consumer Safety (SCCS) between 2008-2019 dealing with 88 cosmetic ingredients are being processed and the information is stored in Excel files. Next, these are converted automatically into a Web Ontology Language (OWL) knowledge base according to a data scheme we have developed. The converted data is stored as RDF (Resource Description Framework) graphs, allowing us to engage with the data using graph query languages. For the data scheme of the KB, officially adopted OECD toxicity testing guidelines have been profiled for the endpoints acute toxicity, repeat dose toxicity, and toxicokinetics & skin absorption. SMILES is included for machine-readable purposes and Klimisch scores to evaluate the reliability of the reported studies. When needed, an expert's opinion was consulted to ensure the accuracy of the observed effects in laboratory animals.

Results: Until now, 76 of the 88 cosmetic ingredients have been processed and their information transcribed into Excel files, of which XX have been converted into RDF and put into the KB. The results are used to improve the structure of the KB and to improve the further automatic conversion of the remaining ≈520 opinions (period 1998-2021) to complete the KB.

Discussion and Conclusion: The KB is developed to facilitate the search for existing information on cosmetic ingredients, including, e.g., *in vivo* indications of organ and systemic toxicity. When completed, it will serve for setting up hypothesis-driven case studies on the use of IATAs for systemic toxicity assessment of cosmetic ingredients.