

Development of an Open-Source Integrated Test Strategy for Skin Sensitization Potency

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Regulatory authorities require testing to identify substances with the potential to cause allergic contact dermatitis. Integrated testing strategies (ITS) that combine *in silico* and *in vitro* test methods have been proposed to reduce or eliminate animal use for this testing. A published skin sensitization ITS used a Bayesian network (BN ITS-2) to structure *in silico* and *in vitro* assay results that map to the OECD Adverse Outcome Pathway for skin sensitization. This model was developed using a commercial software package. To increase accessibility and algorithmic transparency, we developed an open-source ITS (OS ITS-2) using tools in the R software package to build and perform exact inference using a Bayesian network. R versions of widely used algorithms for supervised discretization and latent class learning were substituted for proprietary algorithms. The overall classification accuracies for the OS ITS-2 and the BN ITS-2 were the same, with three compounds misclassified by both methods. Two case studies of representative substances, chlorobenzene and 2-mercaptobenzothiazole, were developed and evaluated using the NICEATM skin sensitization database. Value of information was assessed for the *in vitro* assays and *in silico* inputs. The OS ITS-2 increases availability and transparency of the ITS and represents a major step in allowing the ITS to be reproduced and tested, properties that are essential for implementation in a regulatory framework.

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