Introduction

The use of animal testing is becoming increasingly controversial. As an alternative, in vitro and in silico methods are being developed to predict skin sensitization. This approach, known as a tiered screening system, involves using a combination of in vitro methods and in silico models to screen potential skin sensitizers without the use of animals. 

Study Design

The National Toxicology Program (NTP) Laboratory Center for the Evaluation of Carcinogenic Substances (LCECS) and the Intramural Skin Sensitization Testing (ISSST) Laboratory have demonstrated the value of using a tiered approach to skin sensitization testing. Two tiered strategies were developed: Strategy A, using a single tier of methods, and Strategy B, using two tiers of methods.

Model Building and Evaluation

• The LLNA predicted human potency categories with an accuracy of 69% for the 87 substances tested in this study. 
• The SVM models performed better than other machine learning approaches in predicting LLNA hazard categories.
• The best performing model (machine learning approach + variable group) for each strategy was selected using cross-validation.

Results

Performance of the Machine Learning Approaches

• SVMs and random forests were used to predict skin sensitization categories using previously compiled high-quality test data. 
• The SVM models performed better than other machine learning approaches in predicting LLNA hazard categories.

Conclusions

• The tiered approach to skin sensitization testing has been shown to be effective in predicting skin sensitization.
• The use of machine learning approaches can improve the accuracy of skin sensitization predictions.

References


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