

Further Optimization of the OptiSafe™ Nonanimal Test Method

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OptiSafe™ is a shelf-stable, nonanimal test method to determine whether a chemical or mixture of chemicals is an ocular irritant. Previous studies have demonstrated that the method exhibits high sensitivity; however, the false-positive (FP) rate is around 40%, similar to other nonanimal ocular irritation test methods. The goal of the current study is to reduce the FP rate with specific formulation improvements. Based on a study of chemicals associated with FPs and their respective functional groups, a high percentage of OptiSafe FPs had aryl and ether functional groups and/or chemicals associated with an oxidative chemistry. Based on the high antioxidant capacity of the eye, we evaluated various antioxidants and determined that the FP rate could be reduced by including antioxidants in the formulation without impacting the false-negative (FN) rate. The updated version is now called OS2. Based on the in-house retesting of chemicals from a prior validation study, the specificity of the GHS not classified (NC) category improved from 60.0% (21/35) to 80.0% (28/35) using the new formulation, protocol, and prediction model. The sensitivity remained at 100% (38/38), and overall accuracy improved from 80.3% (57/71) to 90.4% (66/73). Based on the chemicals tested from the previous validation study and an expanded number of ocular corrosives for the detection of NC chemicals, the FP rate was 19.0% (8/42), the FN rate was 0.0% (0/81), and the accuracy was 93.5% (115/123). For the detection of ocular corrosives (GHS category 1), the FP rate was 26.9% (18/67), the FN rate was 9.1% (4/44), and the accuracy was 80.2% (89/111).