Phototoxicity of ethyl vanillin: comparison of two in vitro methods

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ABSTRACT

Ethyl vanillin (EV; C8H9CHO; CAS # 111-24-2) is a widely used, aromatic aldehyde fragrance material which imparts an intense vanilla odor to a host of cosmetic, fragrance and food products. The potential phototoxicity of the material is of concern. In a 3T-NeoRed Phototox Reactor (EPI232) ethyl vanillin, with a mean phototoxic effect (MPE) ≥ 0.15, was predicted to be phototoxic.

INTRODUCTION

The 3T-NeoRed Phototox Reactor (EPI232) (see Figure 1) is an instrument designed for a comprehensive, human-relevant in vitro phototoxicity study. The EPI232 is a closed system that allows for controlled exposure to UVA light for 50 ± 2 min (+UVA) at room temperature resulting in an irradiation dose of approximately 17 ± 1 mW/cm2. The EPI232 uses the device as a test material exposure chamber. After exposure, the cells are returned to the test tube and the relative fluorescence is measured. This is then compared to the corrected mean value for the solvent controls not exposed to UVA (–UVA). Each definitive assay was performed in triplicate. The relative fluorescence is assigned a phototoxic response index (PRI) value.

MATERIALS AND METHODS

3T-NeoRed Phototox Reactor

Phototoxicity and cytotoxicity of ethyl vanillin were evaluated using the EPI232. The 3T-NeoRed Phototox Reactor (EPI232) (Figure 1) is an instrument designed for a comprehensive, human-relevant in vitro phototoxicity study. The EPI232 is a closed system that allows for controlled exposure to UVA light for 50 ± 2 min (+UVA) at room temperature resulting in an irradiation dose of approximately 17 ± 1 mW/cm2. The EPI232 uses the device as a test material exposure chamber. After exposure, the cells are returned to the test tube and the relative fluorescence is measured. This is then compared to the corrected mean value for the solvent controls not exposed to UVA (–UVA). Each definitive assay was performed in triplicate. The relative fluorescence is assigned a phototoxic response index (PRI) value.

Epiderm® Skin Model Multi-Dose Phototoxicity Assay

Photocytotoxicity and photocytology were compared to determine the material induced phototoxic response. Ethyl vanillion was evaluated in the Epiderm® Skin Model Multi-Dose Phototoxicity Assay (EPI234). The EPI234, manufactured by the ZE-BET software (Phototox 2.0) was used to calculate the percent of control survival value for the solvent controls exposed to UVA (UVA) (–UVA). The software determined a percent of control survival value for each of the solvent controls exposed to UVA (UVA) (–UVA). The software determined a percent of control survival value for each of the solvent controls exposed to UVA (UVA) (–UVA). The software determined a percent of control survival value for each of the solvent controls exposed to UVA (UVA) (–UVA). The software determined a percent of control survival value for each of the solvent controls exposed to UVA (UVA) (–UVA). The software determined a percent of control survival value for each of the solvent controls exposed to UVA (UVA) (–UVA). The software determined a percent of control survival value for each of the solvent controls exposed to UVA (UVA) (–UVA). The software determined a percent of control survival value for each of the solvent controls exposed to UVA (UVA) (–UVA).

RESULTS

Skin reactions – Human Phototoxicity Test

No serious adverse events occurred during the test. A total of 27 subjects, 8 male and 19 female, 24-40 years of age, were exposed. The application of 1% 3 T-NeoRed Phototox Reactor (EPI232) and a multiwell plate to determine the relative photoresponse of the subject. Each subject was exposed to a single concentration of ethyl vanillin, 0.1%, 1%, 3% or 6% in polyethylene glycol (PEG). The tissues were subjected to UVA for 60 ± 2 minutes (6 J/cm2). For any dose, if the test material induces a 30% decrease in viability in the presence of UVA compared to viability in the absence of UVA, the test is considered phototoxic. A human phototoxicity study demonstrates how the in vitro assay predictions correlate with clinical data. Each subject was exposed to a single concentration of ethyl vanillin, 0.1%, 1%, 3% or 6% in polyethylene glycol (PEG). The tissues were subjected to UVA for 60 ± 2 minutes (6 J/cm2). For any dose, if the test material induces a 30% decrease in viability in the presence of UVA compared to viability in the absence of UVA, the test is considered phototoxic. A human phototoxicity study demonstrates how the in vitro assay predictions correlate with clinical data. Each subject was exposed to a single concentration of ethyl vanillin, 0.1%, 1%, 3% or 6% in polyethylene glycol (PEG). The tissues were subjected to UVA for 60 ± 2 minutes (6 J/cm2). For any dose, if the test material induces a 30% decrease in viability in the presence of UVA compared to viability in the absence of UVA, the test is considered phototoxic. A human phototoxicity study demonstrates how the in vitro assay predictions correlate with clinical data. Each subject was exposed to a single concentration of ethyl vanillin, 0.1%, 1%, 3% or 6% in polyethylene glycol (PEG). The tissues were subjected to UVA for 60 ± 2 minutes (6 J/cm2). For any dose, if the test material induces a 30% decrease in viability in the presence of UVA compared to viability in the absence of UVA, the test is considered phototoxic. A human phototoxicity study demonstrates how the in vitro assay predictions correlate with clinical data. Each subject was exposed to a single concentration of ethyl vanillin, 0.1%, 1%, 3% or 6% in polyethylene glycol (PEG). The tissues were subjected to UVA for 60 ± 2 minutes (6 J/cm2). For any dose, if the test material induces a 30% decrease in viability in the presence of UVA compared to viability in the absence of UVA, the test is considered phototoxic. A human phototoxicity study demonstrates how the in vitro assay predictions correlate with clinical data. Each subject was exposed to a single concentration of ethyl vanillin, 0.1%, 1%, 3% or 6% in polyethylene glycol (PEG). The tissues were subjected to UVA for 60 ± 2 minutes (6 J/cm2). For any dose, if the test material induces a 30% decrease in viability in the presence of UVA compared to viability in the absence of UVA, the test is considered phototoxic. A human phototoxicity study demonstrates how the in vitro assay predictions correlate with clinical data.