A Risk Assessment-Based Approach to Skin Safety Evaluation

Seok KWON*

Abstract
The conduct of a scientifically sound safety assessment of new ingredients and finished products is essential through their development and introduction into the marketplace of consumer products. Such assessments are based on a risk assessment paradigm established by the National Academy of Science (NAS) that consists of a four-step process: hazard identification, dose-response assessment, exposure assessment, and risk characterization. This paper describes an approach to risk assessment for induction of skin sensitization that builds on the principles of general risk assessment and characterizes the risk from human exposure to skin sensitizers. As such, this approach is used to establish an acceptable exposure level for a skin sensitizer in consumer products.

Key words: exposure-based risk assessment, quantitative risk assessment, skin sensitization, skin sensitizers, allergic contact dermatitis.

1. Introduction

Manufacturers of consumer products are responsible for ensuring the safety of their products and product ingredients that come into direct or indirect contact with the skin. Many chemicals in common use today possess, to some degree, the potential to cause contact allergy. However the fact that a chemical is a contact allergen does not mean it cannot be formulated into a consumer product at safe levels. It is well known that ingredients with known contact allergy potential can be formulated into consumer products at levels that are safe so long as the in-use exposures are below the recognized thresholds for induction of sensitization. Thus, the conduct of a thorough skin sensitization risk assessment prior to introduction of new ingredients and products into the marketplace is essential.

An exposure-based risk assessment (EBRA) approach is currently applied to the induction of skin sensitization. 1–3 Use of EBRA here is an extrapolation of quantitative risk assessment (QRA) methods that are widely accepted in general toxicology. This approach takes into consideration of both an understanding of the inherent potential of a new chemical to cause skin sensitization and actual risks associated with induction of skin sensitization and/or allergic contact dermatitis (ACD) under exposure conditions typical of all intended and reasonably foreseeable uses of the product by consumers. The EBRA approach is also used to establish an acceptable exposure level for a skin sensitizer in consumer products. This paper describes the four-step process of the risk assessment for the induction of skin sensitization.

2. Hazard Identification

In the skin sensitization risk assessment process, the hazard is identified as the inherent potential of a new chemical to cause skin sensitization. The tools used to determine a hazard include an understanding of the physico-chemical properties of new chemicals, analysis of structure activity relationships (SAR), pre-clinical testing (e.g., Local Lymph Node Assay (LLNA)), and use of historical human data. 4,5

Skin sensitizers penetrate through the stratum corneum into the viable epidermis where they are recognized and processed by epidermal Langerhans cells (LC). 6 These processed allergens are then presented to specific T lymphocytes by LC and a subsequent proliferation of these specific T lym-