

One NIOSH Approach to Estimating Dermal Absorption

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Skin diseases are recognized as the second leading occupational disease in the US. These diseases are local effects due to dermal exposures to chemicals, and there is an uncounted toll of systemic effects as well. In considering ways in which to improve the NIOSH recommendations for identifying and controlling diseases due to dermal exposures, NIOSH researchers have focused on the utility of predictive equations for percutaneous absorption to help identify hazards resulting in systemic effects. Currently, the Robinson Equation is widely used for this purpose, but it has many shortcomings, including its basis in uncertain data and its inability to predict important time-dependent variations in absorption.

In our approach, the experimental skin permeation data available in the literature were critically reviewed and some important flaws were reported. The main focus of the work is the development of a computer-based model of time-dependent skin absorption using realistic depictions of stratum corneum morphology tied to a series of experimental studies to obtain detailed information on the pathways chemicals take through the stratum corneum and to check the model's predictions. This project is part of the interdivisional NORA Dermal Exposure Research Program.

A recent publication has identified flaws in permeability data reported in the literature (Frasch and Landsittel, 2002). A second publication (Frasch, 2002) describes the modeling approach and demonstrates its advantages over other current approaches. As this work is refined and validated, it is anticipated that this model will replace the Robinson equation in the NIOSH approach to identifying chemicals that are hazardous by the dermal route, and they will allow extension to a variety of situations in which the non-time dependent equations will give misleading information.

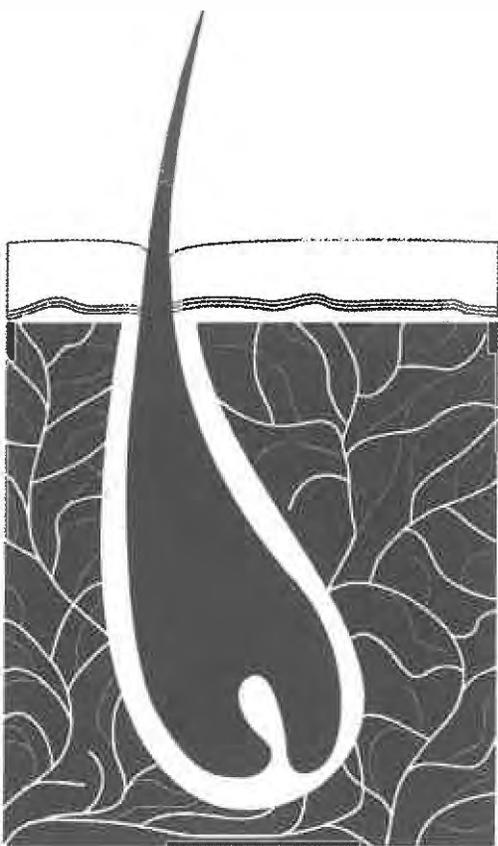
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