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Book Review

SKIN BARRIER, by Hans Schaefer and Thomas E. Redelmeier, 324 pages, Karger, Basel, 1996 (hard cover).

This book is a comprehensive and up-to-date review of the field of percutaneous absorption, its relation to skin structure, and applications to product development and toxicology. The organization is logical and convenient. Drawing upon a wide range of authoritative sources, the current state of knowledge is summarized and, in some cases, interpreted. Researchers will find this volume a useful summary of the state of the art as well as a valuable key to the recent primary literature.

The book is divided into six chapters, which begin with a description of the biological underpinning of the skin's resistance to diffusion, go on to the relation between chemical structure and penetration, penetration measurement and prediction, formulation and biological factors, and conclude with recommended measurement approaches. Each chapter begins with a brief introductory statement and ends with a summary of the main points. The references are collected in a single section at the end of the book. Many diagrams and graphs illustrate the text.

The first chapter, "Structure and Dynamics of the Skin Barrier," reviews structure and biochemistry, emphasizing the dynamic nature of the skin. The second chapter zeroes in on the makeup of the horny layer, examining in particular lipid composition and structure, as permeation is believed to occur chiefly via the intercellular lipid. The "brick-and-mortar" model is used as a basis for discussion. Various techniques used to obtain information on physical properties of the barrier membrane are described, along with the salient results.

The next chapter describes the role of permeant chemistry in percutaneous absorption and shows that there is a correlation with studies utilizing model membranes, such as liposomes. The evidence for the existence of functional pores in stratum corneum is presented. Some of the permeant variables discussed are octanol-water partition coefficients, ionization, and molecular weight.

Methodology is the focus of the fourth chapter. The most relevant measurements, *in vivo* studies in humans, are discussed first. For various reasons it is often necessary to rely on *in vivo* data from animal studies or *in vitro* experiments utilizing excised skin. Recommended protocols and the strengths and limitations of various techniques are discussed. *In vitro* penetration experiments rely on the fact that the stratum corneum is the skin's primary barrier to penetration. They are the source of most of our current knowledge of the effect of vehicles and environmental variables on skin penetration.

Next is a chapter on formulation and biological factors affecting percutaneous absorption. Practical matters affecting delivery into the skin, such as evaporation and the *in situ* formation of supersaturated solutions, are included. The uses and drawbacks involved in penetration enhancement by chemical agents are dis-

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cussed. Certain types of diseased skin are more permeable than normal, intact skin. Other variables include hydration, temperature, contact time, and anatomic site.

The final chapter teaches when and how to apply percutaneous absorption measurements to meet four major objectives: transdermal development, formulation of dermatologicals, safety assessment of cosmetics, and risk assessment following dermal exposure to hazardous environmental or occupational chemicals. Transdermal products target the circulation, and so standard techniques for monitoring bioavailability, i.e., blood level profiles, are utilized. In the case of dermatologic preparations, blood concentrations are usually below detection limits. *In vitro* comparisons utilizing excised human skin or a relevant animal substitute are useful in formulation but are not yet accepted as a bioavailability standard by regulatory agencies. Systemic toxicity following skin exposure is a function of the inherent toxicity of the compound in question and its absorption efficiency. For recognized toxins, the biological implications are known; the percutaneous absorption must be estimated or measured.

This book is highly recommended for scientists working in the areas of development of topical products and toxicology following topical exposure. Those involved in regulatory affairs related to dermatologicals and cosmetics may also benefit.—**Joel L. Zatz**—Rutgers University

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