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Drug Delivery from Topical Formulations: Theoretical Prediction and Experimental Assessment

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I. INTRODUCTION

Drug delivery from topical formulations for local or systemic effects essentially involves passive diffusion of the drug through the skin. The release of a drug molecule from a vehicle into the skin and diffusion across the skin are controlled by physicochemical factors sensitive to the molecular properties of the permeant, the vehicle, and the skin (1). Katz and Poulsen (2) have identified four categories of interactions with bearing on the delivery process. Rate-influencing interactions are possible between the (1) drug and skin, (2) vehicle and skin, (3) drug and vehicle, and (4) drug, vehicle, and skin. Examples of drug–skin interactions include alteration of the surface structure of the skin by the drug components of formulations (e.g., hydration of the stratum corneum by sodium pyrrolidine carboxylate) as well as the binding of drugs to constituents of the skin as they diffuse through the tissue field. A vehicle–skin interaction occurs when one or another of the vehicle's main components, here meaning those components that principally determine the delivery matrix of the formula, effects a change in the physical state of the skin, in turn, affecting the skin's permeability. Vehicle–skin interactions can be divided into three categories: (1) penetration enhancement effects brought about by direct solvent action on the skin, (2) the vehicle's general influence on the state of

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