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The Importance of Epidermal Lipids for the Stratum Corneum Barrier

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I. EVOLUTION OF CURRENT CONCEPTS OF STRATUM CORNEUM STRUCTURE

The old image of mammalian stratum corneum, based on routine histological preparations, is one of a loosely bound layer in various stages of disorganization and shedding (Table 1). This misleading image, refuted by physicochemical (1), frozen-section (2-4), and freeze-fracture (5-7) studies, led to the long-held view that the barrier resides at the stratum granulosum (SG)-stratum corneum (SC) interface (8). New appreciation for the integrity of the SC initially led to the concept that the full thickness of this layer is functionally competent (1,9), a view that analogized the stratum corneum to a homogeneous film ("plastic wrap" hypothesis; 9), a view supported by x-ray diffraction studies that demonstrated highly ordered lipid structures in the SC (10). The homogeneous film analogy views percutaneous transport as occurring transcellularly, without regard to membrane, intercellular, or intracellular compartments (9,11), and assumes that the SC is devitalized (i.e., metabolically inert, with permeability phenomena regulated solely as a passive membrane; 9).

A. The Two-Compartment Model

Studies outlining the evidence supporting a two-compartment model are outlined in Table 2. In 1968, Middleton first reported certain straightforward, yet elegant, studies that tended to refute the homogeneous film concept (11). Whereas Irvin Blank had shown years