drug *in vivo* (7–9), and to disrupt skin barrier function (19). Also, this technique has been used to collect SC lipids and protein samples (4, 20) and to detect proteolytic activity associated with the SC (21), quantitatively estimate enzyme levels and activities in the SC (22) and allows detection of metal in the SC (23, 24). Tape stripping has been used to disrupt the skin barrier before percutaneous peptide and DNA immunization (25–28). In addition, tape stripping is of sufficient utility to have been proposed by the Food and Drug Administration (FDA) as part of a standard method to evaluate bioequivalence of topical dermatological dosage forms (29).

This chapter reviews the stripping method and its application on the penetration enhancement into the SC and topical vaccination and defines restrictions and drawbacks.

44.2 SKIN BARRIER FUNCTION

The SC is a permeability barrier that depends upon the presence of a unique mixture of lipids in the SC's intercellular domains. The SC consists of keratin-filled cells, the corneocytes, entirely surrounded by crystalline lamellar lipid regions. The composition and thickness of the SC lipids strongly differ depending on animal species (30). The major lipid classes in the SC are ceramides (CERs), cholesterol (CHOL), and free fatty acids (FFAs). Both qualitative and quantitative compositions of the barrier lipids are important in maintaining an efficient skin barrier.

These lipids exist as a continuous lipid phase, occupying about 20% of the SC volume, arranged in multiple lamellar structures. All CERs and fatty acids found in the SC are rod and cylindrical in shape; this physical attribute makes them suitable for the formation of highly ordered gel-phase membrane domains. The CHOL is capable of either fluidizing membrane domains or of enhancing rigidity, depending on the physical properties of the other lipids and the proportion of CHOL relative to the other components (31). Intracellular lipids that form the only continuous domain in the SC are required for a competent barrier.

Efforts have been undertaken to characterize the lipid lamellar regions. Based on freeze-fracture electron microscopy, differential scanning calorimetry, and x-ray diffraction studies, the lipids appear arranged as lamellar structures, whose organization is strongly dependent on lipid composition (1). Human lipids are organized in two lamellar phases with a periodicity of approximately 13 and 6 nm, respectively. SC lipids, CERs, CHOL, and FFAs form the orthorhombic lateral packing, a densely packed structure. However, in equimolar mixtures prepared for CHOL and CERs, the major lipid fraction forms a lamellar phase (hexagonal lateral packing) with a periodicity of 12.8 nm. The addition of FFAs to CER/CHOL mixtures induced a transition from a hexagonal to orthorhombic lateral packing (32).

Diseases such as atopic dermatitis, psoriasis, and contact dermatitis are associated with barrier dysfunction. Most skin disorders that have a diminished barrier function present a decrease in total CER content, with some differences in their pattern (33–35). Pilgram et al. (36) reported that in cases of diseased skin, an impaired barrier function is related to an altered lipid composition and organization. In atopic dermatitis SC, they found that in comparison with healthy SC, the presence of the hexagonal lattice (gel phase) is increased with respect to the orthorhombic packing (crystalline phase). From lipid composition studies of atopic skin, intercellular lipids, especially CERs, play an important role in the barrier function and lipid organization. The lipid differences may be partially due to secondary increased cell turnover, rather than a primary cause-and-effect relationship.

44.3 STRIPPING FACTORS

When tape stripping is employed, several factors are important for standardization: (1) number of strips, (2) types and size of tapes, (3) the pressure applied to the strip prior to stripping and the peeling force applied for removal, and (4) anatomic sites. Some parameters are summarized in Table 44.1. We compared the experimental method, i.e., the type and size of tape, pressure and time applied on the skin, and number of strips on the stripping. Stripping data vary according to experimental conditions.