III. COMPOSITION OF SKIN SURFACE LIPIDS

Skin surface lipid primarily contains diglycerides, cholesterol, fatty acids, triglycerides, wax esters, cholesterol esters, and squalene (7). The amounts of these components and their variations with anatomical location have also been investigated. Table 1 lists the results obtained by Greene et al. (11). When the specific structures of the lipids in these general categories are examined, the skin surface lipid becomes significantly more complex. Not only do the chains of the lipids exhibit different lengths and degrees of saturation, but they also contain odd-numbered-carbon chains, uncommon in biological systems, and significant branching (12). The amount that the lipid fractions of human sebum exhibit these characteristics is given in Table 2 (12).

The complexity of the chemically diverse mixture of lipid that eventually reaches the skin surface is a result of equally diverse influences on the sources of this lipid. The two sources already mentioned are always associated with skin surface lipids and warrant further discussion. The sebaceous gland is considered the primary, if not exclusive, source of squalene. Classic work by Nicolaides and Rothman (13) demonstrated that the sebaceous glands contain an incomplete enzyme system, compared with the epidermis, rendering the sebaceous gland incapable of finishing the synthesis of cholesterol from squalene. For this same reason, the source of cholesterol is distinctly epidermal. Use of this fact explained the bulk differences in the anatomical variation in human skin surface lipids. As seen in Table 1, the forehead, which contains 400 to 800 sebaceous glands per square centimeter (7), produces skin surface lipid rich in squalene and low in cholesterol. This is because the skin surface lipid of the forehead is primarily of sebaceous origin. Conversely, the surface lipid of leg skin is high in cholesterol (9.4%) and low in squalene (6.2%) because of the greatly reduced sebaceous contribution (11).

The source of the fatty acids found on the skin surface is both epidermal and indirectly sebaceous. Elias et al. (14) has characterized human epidermal lipids (Table 3) and found the free sterols/free fatty acid ratio for the face to be 0.9. Assuming that all of the cholesterol characterized in Table 1 for the forehead is of epidermal origin, then only about 6% of the free fatty acid on the forehead skin surface is of epidermal origin. The remainder is the hydrolysis product of triglycerides that originate in the fatty acid-free sebum (15). Kligman showed that the bacterium *Corynebacterium acnes*, which inhabits the follicular canal, is responsible for this hydrolysis (16). Variations in the bacterial flora among different individuals is used to explain why comparisons between individuals exhibit dramatic differences in the amount of fatty acid in their