IV. DRUG DELIVERY FROM TOPICAL SURFACTANT ASSOCIATION COLLOIDS

Although relatively few microemulsion and liquid crystalline systems that are suitable for topical use have been described in the literature, even fewer systems have been evaluated by percutaneous transport techniques. In this section, the systems that have been studied will be described.

A. Microemulsions

One of the first, and certainly most interesting studies of topical drug delivery from a microemulsion, compared with a gel and cream of similar composition, was reported by Ziegenmeyer and Fuhrer in 1980 (49). In this study, the three formulations evaluated contained the same amount of dodecane and water. The amount of decanol was varied, and polyoxyethylene 7–lauryl ether was the surfactant used. In vitro experiments using skin membranes and 1% tetracycline HCl formulations showed that much less active agent penetrates through the skin from the cream than from the gel and that both of these formulations are definitely exceeded in effect by the microemulsion. In vivo studies using fluorescent tetracycline confirmed that the microemulsion was superior to the other systems in ability to promote penetration.

A more comprehensive study of topical drug delivery from a microemulsion was recently undertaken by our research groups (50–52). This study focused on the microemulsion and liquid crystalline regions that result from the water–octanol–AOT system. As seen in Figure 6, the phase behavior of this system is truly unique, especially considering the large extension of the cubic liquid crystalline (i.e., ringing gel) phase. The close proximity of the liquid crystalline regions to the microemulsion region allows evaluation of the effect of vehicle structure upon percutaneous transport of a drug. For this unique system, this evaluation can be completed for vehicles that vary in component composition by only a few weight percent. Also noteworthy is the ability of the 58:42 AOT/octanol weight ratio to incorporate greater than 70% water into the microemulsion region. Thus, microemulsions with the same AOT/octanol ratio, but with widely ranging (15–70 wt%) amounts of water were evaluated for drug delivery.

The initial study (50) limited itself to examining the flux of tritium-labeled water from four microemulsion vehicles across human cadaver skin. Each of the vehicles has the set ratio of 58:42 AOT/octanol and ranged in water content as shown in Table 2. In an attempt to separate vehicle effects upon water transport from the