Table 17.2 Water Self-Diffusion and Normalized In Vitro Transdermal Flux Values for the Microemulsion Formed by Addition of Water to a 58:42 Weight Ratio of AOT/Octanol

% Water	X Water	D/Dw	Normalized flux (ave)
15	0.68	0.035	0.89, 0.78 (0.84)
35	0.87	0.072	2.9, 2.1 (2.5)
45	0.91	0.100	
52	0.93	0.200	
58	0.94	0.353	4.9, 5.4 (5.2)
67	0.96	0.363	6.2, 2.9 (4.5)

skin barrier effects associated with the stratum corneum, the diffusion of water within the vehicle was measured using a pulsed field gradient fourier transform NMR technique (53). The unitless value D/Dw is the ratio of the self-diffusion coefficient for water in the microemulsion vehicle divided by the self-diffusion coefficient for water in water. Therefore, a D/Dw value of 0.100 means than, on the average, water in the 45% water microemulsion environment diffuses at one-tenth the rate that a water molecule would diffuse in a totally aqueous environment. The initially low values for D/Dw for microemulsions of low water content, and subsequent increase with addition of water, can be attributed to binding of the water molecules to the surfactant headgroup. Thus, for the 15% water microemulsion, most of the water in the microemulsion is bound to the surfactant headgroup and is not available for transport across the skin. The result is that transport of water across the skin from this particular microemulsion is less than the transport of water from neat water, that is, normalized flux is less than unity. Pretreatment studies using octanol, AOT, and AOT/octanol (58:42 ratio; Table 3) further indicated that the enhancement in water penetration from the high water content microemulsions was a result of a synergistic effect between AOT and octanol and was not due to the vehicle's microemulsion structure.

Additional studies that evaluated the in vitro transdermal transport of labeled glucose from the microemulsions across cadaver skin (51) showed that the glucose essentially crossed with the water. Thus, microemulsion systems that showed high water transport, also demonstrated high glucose transport when an infinitely small amount of labeled glucose was spiked into the microemulsion.