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The Application of the Convective Diffusion Model and the Film Equilibrium Model to Surfactant-Facilitated Dissolution of Gliclazide.

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Abstract: Gliclazide is practically insoluble in water, and has low dissolution rate. Therefore, it was of interest to improve its dissolution rate using anionic and cationic surfactants. The intrinsic dissolution rates of gliclazide in solutions of sodium dodecyl sulfate (SDS) and in solutions of tetradecyltrimethyl ammonium bromide (TDTMAB) were measured using the rotating disk method to study the convective diffusion transport of drug -loaded micelles. Two different approaches were applied to the experimental data ; the convective diffusion model and the film equilibrium model. The two approaches are based on the same fundamental assumptions differing only in their interpretation of the diffusional boundary layer . The results obtained from the film equilibrium model were less satisfactory, and in case of TDTMAB the model was inapplicable (-ve diffusion coefficient). While excellent results were obtained from the convective diffusion model . The free solute diffusion coefficient (Ds) obtained experimentally was 2.47*10-5cm2/sec, and the diffusion coefficient of the drug -loaded SDS micelle (Dsm) estimated was 1.74*10-6 cm2/sec. The drug-loaded SDS micelle radius was 14 ?. The thickness of the diffusional boundary layer was 54 ?m and 22 ?m for the free solute and the drug-loaded SDS micelle, respectively. TDTMAB showed lower effect in improving the dissolution rate of gliclazide than SDS . The drug-loaded TDTMAB micelle diffusion coefficient was 1.03*10-6 cm2/sec. The radius of the drug-loaded TDTMAB micelle and the boundary layer thickness were 24 ? and 19 ?m, respectively.