

THE INFLUENCE OF POLYOXYETHYLENE ETHER SURFACTANTS ON TRANSPORT OF PARAQUAT ACROSS ISOLATED GASTRIC MUCOSA

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Nonionic surfactants display a variety of actions on the absorption of substances by the gastrointestinal tract (Gibaldi & Feldman 1970). The work to be described was part of a study designed to establish the factors governing surfactant effects on gastrointestinal absorption. Polyoxyethylene ethers of the Brij series of surfactants were selected to give ranges of both hydrophilic and alkyl chain lengths. Paraquat was used as a test absorbant because it is normally poorly absorbed. The external muscle coats were rapidly removed from rabbit stomach and the remaining mucosa and muscularis mucosa set up as a membrane between two halves of a modified Ussing type chamber (Ussing & Zerahn 1951).

Both sides of the tissue were exposed to an oxygenated physiological buffer solution maintained at 37°. Viability of the tissue was assessed using measurements of the transepithelial electrical potential difference. The mucosal surface was exposed to ¹⁴C-methyl paraquat in surfactant solutions of varying concentration and transport over a three hour period was determined.

Linear accumulation of paraquat in the serosal solution occurred with time. No evidence for active transport of paraquat was obtained and Fick's Law of diffusion was shown to apply. Polyoxyethylene ethers with ten or twenty oxyethylene moieties caused an increase in paraquat transport from both pre-micellar and micellar solutions. Those surfactants possessing only two oxyethylene moieties had little or no effect on the permeability of the membrane to paraquat.

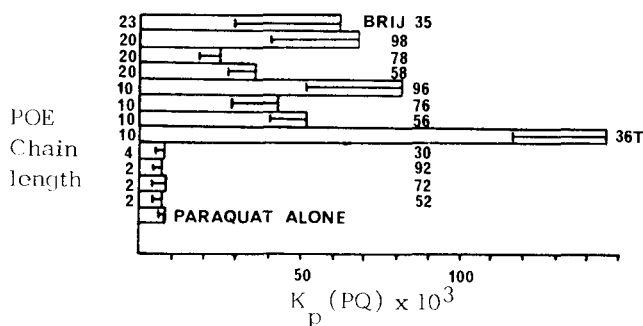


Figure 1. The effects of polyoxyethylene chain length of surfactants (at 1.0%) on paraquat transfer across isolated gastric mucosa of rabbit.

The effects of the more hydrophilic surfactants are probably due to disruption of mucosal cell membranes by solubilization of membrane components. The pattern of effects of polyoxyethylene ethers at concentrations below their critical micelle concentration indicates that the hydrophile/lipophile balance (HLB) is not the dominant factor governing the absorption-promoting effect. At micellar concentrations, however, it appears that the HLB of the surfactant is important in determining the magnitude of the absorption-enhancement effect.

Gibaldi, M. & Feldman, S. (1970). *J. Pharm. Sci.*, 59, 579-589.

Ussing, H.H. & Zerahn, K. (1951). *Acta Physiol. Scand.*, 23, 110-127.