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# INFLUENCE OF SURFACTANTS ON THE IN-VITRO RELEASE AND PERMEATION OF LORAZEPAM FROM TABLETS

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## ABSTRACT

Sodium lauryl sulfate, tween 80, sodium taurocholate and sodium tauroglycocholate were included into lorazepam tablet formulations to increase the dissolution and permeation of the drug. The increasing concentration of the surfactants has increased the dissolution and permeation of the drug. The fractional quantity remained to be permeated versus time plots show the exponential decay.

## INTRODUCTION

Lorazepam (Wy-4036) is a potent tranquilizer and almost insoluble in water[1]. It has been observed that the surfactants have increased the dissolution, permeability and bioavailability of drugs[2-6]. In this study, it has been planned to investigate

the effect of different concentrations of tween 80, sodium lauryl sulfate, sodium taurocholate and sodium tauroglycocholate on the in-vitro release and permeation of the drug through rabbit jejunal sac from tablets and also to validate the findings on the basis of the mathematical model.

## THEORETICAL SECTION

Assume a jejunal sac with reservoir volume V. $Q_o$ is the initial quantity of the drug present in the sac. The sac is placed into permeating fluid maintaining a perfect sink condition. Let us suppose, Qt,Ct,A,D,L and K are the quantity of drug permeated, concentration of the drug at time 't', total surface area of the sac, diffusion coefficient, thickness of the membrane and partition coefficient, respectively. Then, the fractional quantity remained to be permeated can be expressed as :

$$1-qt/Qo = e^{-ADKt/VL} \qquad (1)$$

The above eq. 1 shows that the fractional quantity remained to be permeated falls off exponentially with time.

## MATERIALS

Lorazepam, sodium lauryl sulfate, tween 80, sodium taurocholate and sodium tauroglycocholate were received from CIPLA,Bombay, B.D.H., London, Koch-Light and Ward, Blenkinsop & Co. Ltd., England, respectively.

## METHODS

**Preparation of Tablets** - Each tablet contained lorazepam (2 mg), lactose (90 mg), starch paste, 10% w/v equivalent to 2 mg of starch, potato starch (5 mg), talc (2 mg), magnesium stearate (1 mg) and required amount of surfactant. Two hundred tablets for each batch were prepared. Tablets preparation and their drug content evaluation were performed following the method of Singh and Jayaswal[3].

**In-Vitro Dissolution and Permeation** - The dissolution rate was determined with the help of Thermonik Dissolution Rate Test Equipment USP XVIII (Campbell Electronics, Bombay). The in-vitro permeation of the drug through rabbit jejunal sac was determined by the method of Singh and Jayaswal[2]. Seven tablets were subjected to in-vitro dissolution and permeation from each batch.

## RESULT AND DISCUSSION

The time for 50% drug release ($t_{\frac{1}{2}}$) has been given in the table 1. The smallest value of $t_{\frac{1}{2}}$ has been observed from tablets of the batch SL-5 followed by TW-5, SG-5 and ST-5, respectively. Thus, the increase in dissolution and decrease in $t_{\frac{1}{2}}$ could be due to the greater wetting and solubilization of the drug with the increasing concentrations of sodium lauryl sulfate, tween 80 and sodium tauroglycocholate in the tablet formulations.

TABLE 1

Batch Specification and Mean $t_{\frac{1}{2}}$ for In-Vitro Drug Release

| Batch | Surfactants | Surfactants Solution/ Batch (ml) | $t_{\frac{1}{2}}$, min |
|---|---|---|---|
| C | - | - | - |
| SL-1 | SLS | 0.5 | 22.00 |
| SL-2 | SLS | 1.0 | 22.50 |
| SL-3 | SLS | 3.0 | 16.25 |
| SL-4 | SLS | 5.0 | 11.50 |
| SL-5 | SLS | 10.0 | 6.50 |
| ST-1 | STC | 0.5 | 34.00 |
| ST-2 | STC | 1.0 | 31.00 |
| ST-3 | STC | 3.0 | 28.00 |
| ST-4 | STC | 5.0 | 19.00 |
| ST-5 | STC | 10.0 | 21.00 |
| SG-1 | STG | 0.5 | 49.50 |
| SG-2 | STG | 1.0 | 37.50 |
| SG-3 | STG | 3.0 | 33.50 |
| SG-4 | STG | 5.0 | 25.00 |
| SG-5 | STG | 10.0 | 17.50 |
| TW-1 | T80 | 0.5 | 20.25 |
| TW-2 | T80 | 1.0 | 15.00 |
| TW-3 | T80 | 3.0 | 14.50 |
| TW-4 | T80 | 5.0 | 10.25 |
| TW-5 | T80 | 10.0 | 9.50 |

SLS : Sodium Lauryal Sulfate, STC : Sodium Tauroglycocholate, and T80 : Tween 80

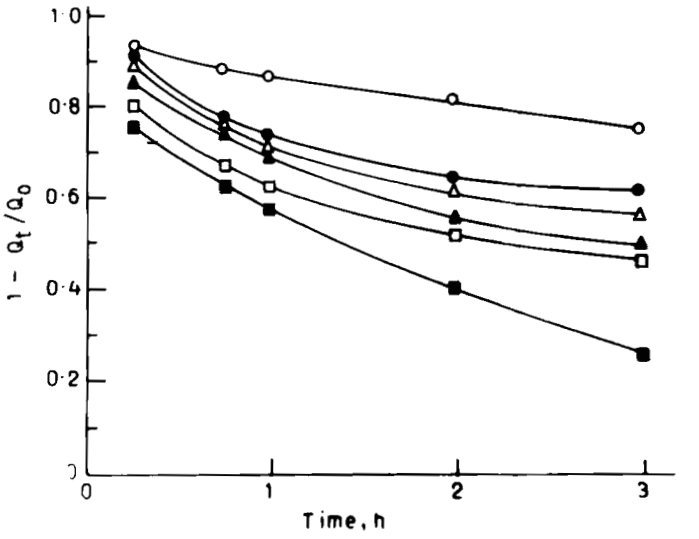


FIGURE 1. A

Fractional quantity of the drug remained to be permeated from tablets containing sodium lauryl sulfate. Key : ○, C; ●, SL-1; △, SL-2; ▲, SL-3; □, SL-4 and ■, SL-5.

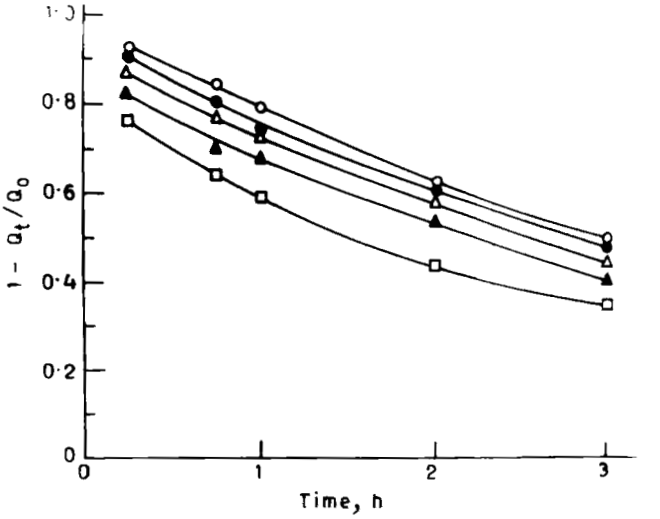


FIGURE 1.B

Fractional quantity remained to be permeated from tablets containing tween 80. Key : ○, TW-1; ●, TW-2; △, TW-3; ▲, TW-4 and □, TW-5.

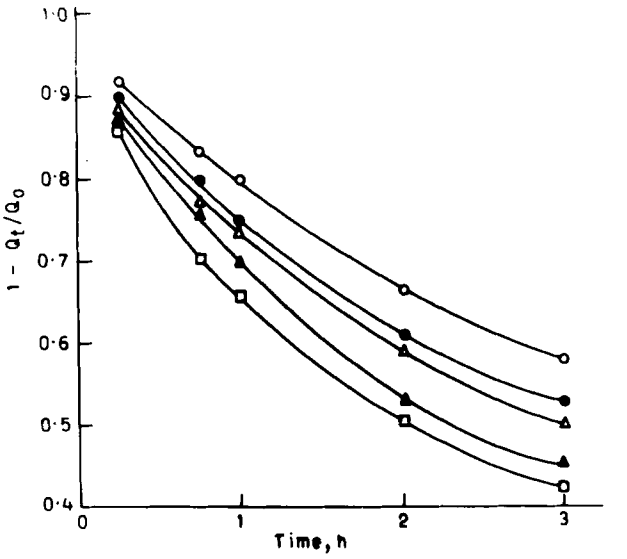


FIGURE 1.C

Fractional quantity remained to be permeated from tablets containing sodium taurocholate. Key ; ○, ST-1; ●,ST-2; △, ST-3; ▲, ST-4; and □, ST-5.

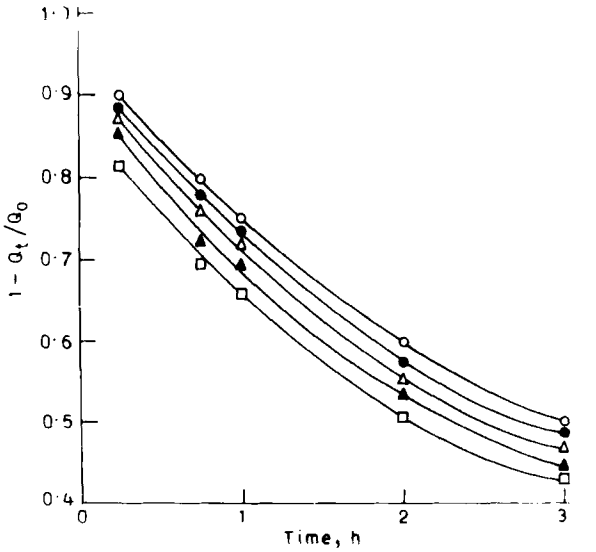


FIGURE 1. D

Fractional quantity remained to be permeated from tablets containing sodium tauroglycocholate. Key : ○, SG-1; ●, SG-2; △, SG-3; ▲, SG-4 and □, SG-5.

The results of the in-vitro permeation of the drug through rabbit jejunal sac have been presented in Figure 1. The figure shows that the permeation is higher and therefore quantity remained to be permeated is lower with the increasing concentration of surfactants.

The (1-Qt/Qo) versus time plots show that the fractional quantity remained to be permeated falls off exponentially with time. This is in accordance of the eq. 1 of the theoretical section and thus, the present findings can be validated mathematically.

## REFERENCES

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