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Effect of Sodium Lauryl Sulfate on the Release of Rifampicin from Guar Gum Matrix

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The release of rifampicin from a matrix compressed from a physical mixture of rifampicin, guar gum and sodium lauryl sulfate was investigated. When sodium lauryl sulfate was incorporated in the matrix, the release of rifampicin was found to be linearly related to the square root of time, however, the release depended on the concentration of the sodium lauryl sulfate. As the concentration of sodium lauryl sulfate increased upto 15%, the release progressively slowed to a minimum, which could be due to the formation of a poorly soluble complex. As the concentration increased further, the release increased as the complex was micellarly solubilized.

One of the simplest method to obtain a controlled release product is to embed or disperse the active ingredient in a heterogeneous matrix by compressing a physical mixture of the compound with a polymeric material. Various studies of the release from matrices in which a surfactant had been incorporated showed a faster release with the addition of the surfactant[1-5]. Choulis and Papadopoulos[6] found that the release of quinine sulfate from a nylon matrix containing sodium lauryl sulfate (SLS)

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was slower than that from a matrix containing polyoxyl 40 stearate. Daly *et al.*[7], noted that the incorporation of 15% SLS in modified hydroxypropylmethylcellulose matrices produced a zero-order release of chlorpheniramine maleate. Feely and Davis[8] reported that the rate release of chlorpheniramine maleate from a hydroxypropyl methylcellulose matrix was reduced as more SLS was incorporated into the matrix. Walls and Parrott[9] reported that when the concentration of SLS was increased to 4% in chlorinated poly (propylene) matrix, the release progressively slowed to a minimum and as the SLS concentration was further increased, the release increased as the complex was micellarly solubilised.

The present investigation is concerned with the effect of sodium lauryl sulfate (anion) incorporated in an inert, heterogeneous matrix on the release of rifampicin (zwitterion).

Rifampicin I.P. was obtained from Aristo Pharmaceuticals Ltd., Madhya Pradesh. Guar gum was procured from Sigma Chemicals). Sodium lauryl sulfate was purchased from S.D. Fine Chem. Ltd. Potassium dihydrogen orthophosphate and sodium hydroxide was procured from Qualigens Fine Chemicals and ascorbic acid from S.D. Fine Chem. Ltd. All these Chemicals were of analytical grade.

Different ratios of rifampicin, guar gum and SLS matrix formulations sufficient for a batch of 25 tablets were mixed thoroughly to ensure complete mixing. Three hundred mg rifampicin tablets were compressed at an applied force of 500 kg/cm^2 and compression time of 11 sec using 11 mm round, flat and plain punches (surface lubricated with talc) on a single stroke tableting machine.

pH 7.4 phosphate buffer having 0.02% w/v of ascorbic acid was used as a dissolution medium to prevent the degradation of released rifampicin in dissolution medium due to atmospheric oxygen. Dissolution was conducted using USP rotating basket method at 100 rpm with 900 ml of dissolution medium at 37±1°. Samples were withdrawn at timed intervals with a pipette fitted with a filter and analyzed spectrophotometrically at 475 nm.

A series of aqueous solutions containing the same amount of rifampicin was titrated with increasing amounts of SLS while the constant volume of solution was maintained and the conductivity measured. The graph between

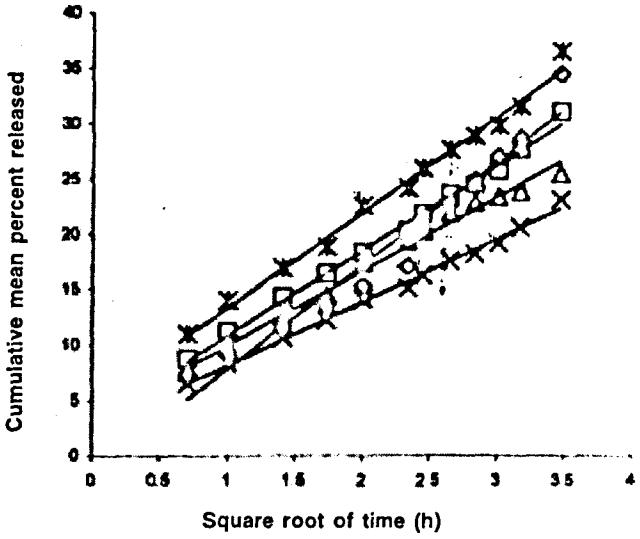

Fig. 1 : Cumulative rifampicin released from matrix tablets with 2:1 ratio of drug:guar were prepared by incorporating in matrice containing , 0% SLS; □, 5% SLS; Δ, 10% SLS; X, 15% SLS; and •, 20% SLS

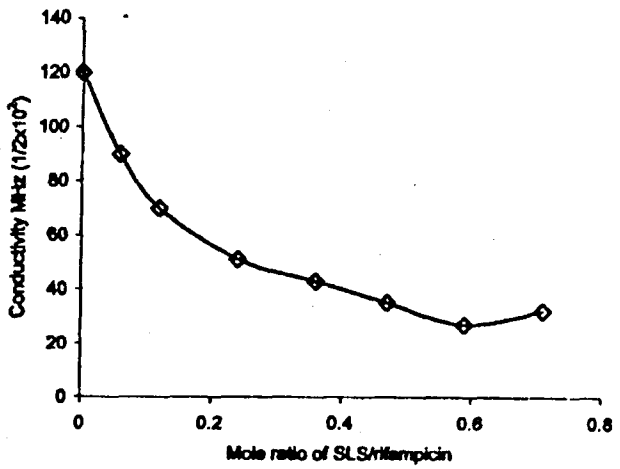

Fig. 2 : Conductivity of rifampicin in presence of Sodium Lauryl Sulfate

conductivity versus percent SLS is given in Fig. 2. As the concentration of SLS increased the conductivity of rifampicin decreased because the poorly soluble complex was formed on the addition of more surfactant.

The release of rifampicin from matrices containing 0-20% SLS was measured and it was found that the rate of release decreased as the concentration of SLS increased as given in Fig. 1.

Analysis by automatic conductometric titration[8] showed that the decrease was due to the formation of a poorly soluble complex between rifampicin and SLS. Complexation reduced the solubility of rifampicin in the solution within the pores of the matrix and slowed release. Perhaps, in addition, complexation and subsequent precipitation provide a more tortuous pathway and a less porous matrix through which the dissolved medicinal compound must diffuse.

At concentration of SLS in the matrix exceeding 15%, the release was faster. The faster release might be attributed to solubilization of the complex into the micellar phase as an ion pair. As a result of solubilization, the concentration of rifampicin in solution increased and consequently, a less tortuous pathway and a more porous matrix would allow faster rifampicin diffusion.

The added SLS in the matrix containing rifampicin retarded the release rate. As more SLS was added, more complex precipitated in a fine state with some flocs. Such precipitation within the channels of a matrix would be occlusive and increase the diffusional pathway and thereby retard the release of rifampicin. When the concentration of SLS exceeds it's critical micelle concentration, the complex appeared to have solubilized.

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