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The effect of surfactants on the radiation sensitivity of benzocaine in aqueous solution

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In a formulated cream the active drug may partition not only between the oil and aqueous phases but between the water and the surfacant micelles which are present in the aqueous phase. The observed rate of radiation-induced reaction may be represented by the expression.

$$K_{obs} = K_m F_m + K_w F_w$$

where K_{obs}, K_m and K_w are the observed, micellar and aqueous reaction rate constants respectively and F_m and F_w are the fractions of drug associated with the micelles and the aqueous phase, respectively, (Winterborn, Meakin & Davies, 1974). Therefore, depending on the relative values of K_m, K_w, K_m and K_w, the drug in a cream formulation may be protected to an extent which would make radiation-sterilization a feasible proposition. This communication is a report on the effect of cetrimide and Tween 80 on the sensitivity of benzocaine to ionizing radiation.

2 ml of $1{\cdot}25 \times 10^{-4}$ M aqueous solutions of benzocaine containing cetrimide (10^{-5}; 10^{-4}; 10^{-3}; and 10^{-2} M) or tween 80 (10^{-3}; 10^{-2}; 10^{-1}% w/v) were irradiated in a ^{60}Co source. The distilled water before use was saturated with oxygen by bubbling O_2 through it for 1 h. Following irradiation 1 ml samples were subjected to a modified Bratton-Marshall reaction and the absorbances of the resulting solutions were measured spectrophotometrically at 536 nm (Meakin, Tansey & Davies, 1971). Plots of percentage residual concentration of benzocaine against dose of radiation (Mrad) are shown in Fig. 1a and 1b.

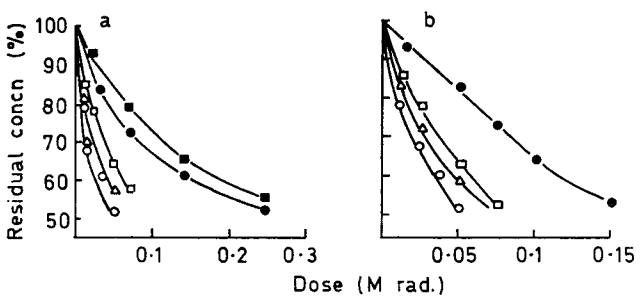

FIG. 1. Plots of % residual concentration of benzocaine against radiation. $1{\cdot}25 \times 10^{-4}$M benzocaine in (a) cetrimide (○—0; △—10^{-5}; □—10^{-4}; ●—10^{-3}; ■—10^{-2}M) and in (b) Tween 80 (○—0; △ 10^{-3}; □—10^{-2}; ●—10^{-1}%).

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