Plots of log cmc against ethoxy groups or hydrocarbon chain length were linear but with different slopes. Although increased hydrocarbon chain length or ethoxy group number decreased the cmc, the effect on counterion binding was different indicating that the mechanisms involved were dissimilar.

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pH–Mobility plots for drug suspension systems and the effect of added surface active agents

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The effect of various surface active agents (SAA), both alone and as mixed ionic types, on the zeta potential of a model suspension system has been previously reported (Kayes, 1973).

An attempt has been made to apply these results to drug suspension systems of griseofulvin, nalidixic acid, thiabendazole and betamethasone. The mobilities of the suspension particles were measured using the flat cell assembly of the Rank Mark II Particle Microelectrophoresis apparatus. The pH-mobility curves, together with the chemical structure of the four drugs are shown below.

With griseofulvin the positive charge at low pH can be attributed in part to protonation of the $\alpha\beta$-unsaturated ketone and partly to the adsorption of hydrogen ions; the negative charge at higher pH, to adsorption of hydroxyl ions.

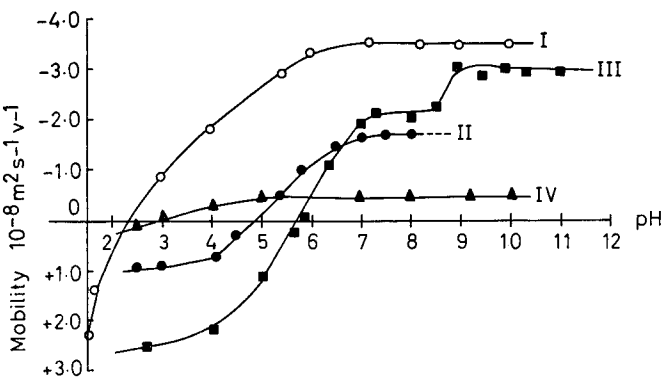
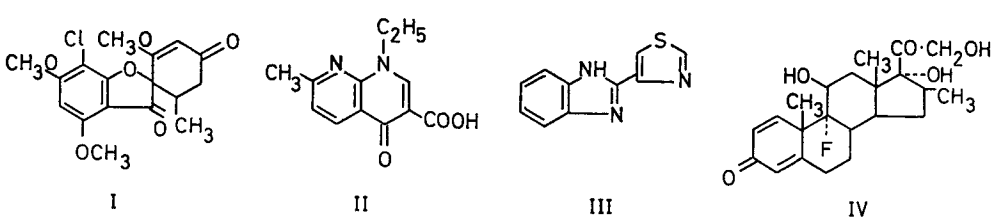


FIG. 1. Variation of mobility with pH for griseofulvin I, nalidixic Acid II, thiabendazole III, and betamethasone IV.



Nalidixic Acid shows a positive charge at low pH attributed to protonation of the =N- group, the gradual increase of negative charge to pH 7 is consistent with the ionization of the –COOH group- the plot gives a pKa value of 5·75 which agrees with the reported value of 6·0 Winningham, Nemoy & Stamey, 1968). Nalidixic Acid slowly goes into solution

above pH 8·0. There is a rapid change in mobility from $+1{\cdot}0 \cdot 10^{-8}$ m^2 s^{-1} v^{-1} at pH 4·0 to $-1{\cdot}62 \cdot 10^{-8}$ m^2 s^{-1} v^{-1} at pH 7·0. Strict control of pH when this substance is presented as a suspension is therefore desirable.

The positive charge at low pH shown by thiabendazole is probably due to protonation of the =N– groups; and the rise in negative mobility between pH 8·0 and 9·0 to ionization of the =NH group. Betamethasone, as expected from its structure shows a mobility pattern apparently depending solely on ion adsorption. The effect of SAA on a steady state mobility of all four drugs follows that found with polystyrene latex–SAA systems and may be typified with griseofulvin at pH 7·0. A single SAA e.g. sodium dodecyl sulphate, causes an increase in negative charge with concentration. Mixtures of non-ionic/ionic SAA's compete for the adsorption sites depending on the appropriate adsorption energies of the different types and their concentrations.

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Viscometric studies on surface agent solutions and the examination of hydrophobic interactions

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Micelles as formed in aqueous solutions of surface active agents (SAA), are suitable models for studying hydrophobic interactions.

Liquid water forms spatial clusters by means of intermolecular hydrogen bonding. On addition of a SAA solute the number of bonds increases and the water molecules become more ordered around the solute molecules forming hydrogen bonded 'microscopic icebergs' around the hydrocarbon 'tail', (Nemethy, 1967), thus causing an increase in viscosity of the solution. An abrupt change in viscosity occurs at the critical micelle concentration (cmc) due to release of these ordered water molecules associated with the monomer. Measurement of viscosity is therefore a suitable method for cmc determination with obvious advantages for non-ionic SAA. SAA studied were alkyl trimethyl ammonium bromides CxTAB with x 10, 12, 14 or 16, prepared synthetically from alkyl bromides and trimethylamine and purified by recrystallization from alcohol–benzene mixtures, and commercial polyoxyethylene monohexadecyl ethers $C_{16}Ey$, the average value of y given as 10, 18, 30 and 60, purified by a distribution method (Weibull, 1960). Purities of all SAA's were checked using surface tension concentration plots. Viscosity measurements were carried out at 25° using an Ostwald capillary viscometer and densities determined using a pycnometer. Cmc values were obtained by plotting reciprocal reduced viscosities versus concentration. Intrinsic viscosities $[\eta]$ at the cmc were, found from plots of reduced viscosity $\eta sp/c$ versus concentration minus the cmc (c–co). Results are shown below:—

	cmc 10^{-5} mol dm^{-3}		$[\eta]$ 10^2g dl^{-1}		cmc mol dm^{-3}		$[\eta]$ 10^2g dl^{-1}
SAA	$1/\eta sp/c.v.c.$	γlog C		SAA	$1/\eta sp/c.v.c.$	γlog C	
C16E10	5·60	6·00	3·9	C10TAB	$6{\cdot}5 \times 10^{-2}$	$6{\cdot}0 \times 10^{-2}$	6·0
C16E18	3·89	3·85	5·4	C12TAB	$1{\cdot}68 \times 10^{-2}$	$1{\cdot}9 \times 10^{-2}$	6·9
C16E30	2·40	2·20	7·5	C14TAB	$3{\cdot}70 \times 10^{-3}$	$3{\cdot}4 \times 10^{-3}$	8·2
C16E60	1·40	1·15	11·7	C16TAB	8×10^{-4}	$8{\cdot}8 \times 10^{-4}$	9·6

Cms's obtained from viscosity determinations agree with those found by surface tension measurement. The cmc values for CxTAB's compare favourably with literature values and show that the cmc decreases as the size of the hydrophobic group increases. There is a