

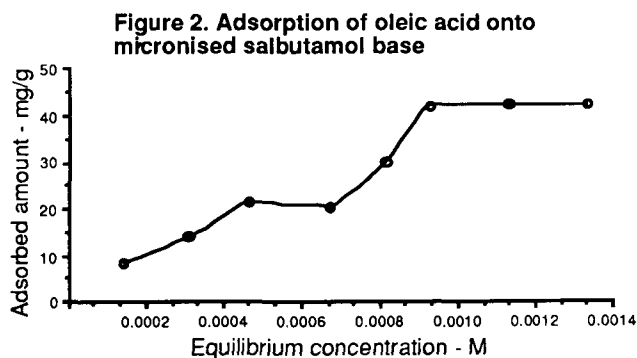
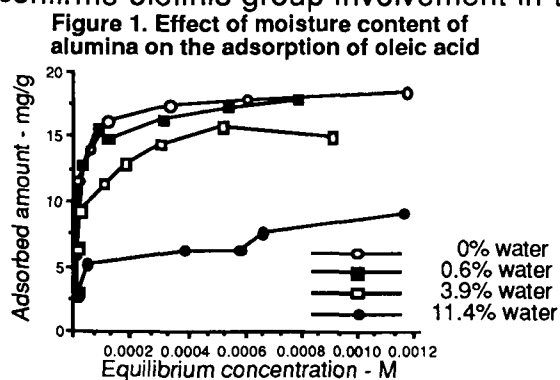
ADSORPTION OF OLEIC ACID ONTO MICROPARTICULATES IN APOLAR MEDIA

J.G. Clarke, S.J. Farr & S.R. Wicks*, Welsh School of Pharmacy, University of Wales College of Cardiff, CF1 3XF. and *Pfizer Central Research, Sandwich, Kent.

Research in the reprographic and pigment industries (Kitahara et al, 1977) has shown stability of non-aqueous colloidal dispersions is provided by electrostatic interactions between surface charges (electrostatic repulsion) as well as the interaction between adsorbed layers of stabilisers (steric repulsion). Suspension type CFC based aerosols used for asthma prophylaxis & treatment are basically apolar colloidal dispersions and thus their stability may be tentatively explained by the principles of colloid science. Surfactants included in the formulation as stabilisers and valve lubricants are added at levels decided upon if not by serendipity then by an empirical process. Optimisation of this level is needed so that retarded propellant evaporation does not cause a deleterious decrease in respirable fraction. Elucidation of the stabilising mechanism could allow more rational formulation and more efficacious inhalers.

A prerequisite to studying steric repulsion is the study of surfactant adsorption. Adsorption isotherms of oleic acid have been obtained on sub micron alumina (2% solids) of different moisture content (obtained by equilibrating alumina over saturated salt solutions of varying relative humidity) and various micronised drugs (0.2% solids; salbutamol base, isoprenaline sulphate & pirbuterol acetate) by using ^{14}C oleic acid as radiotracer (assayed by liquid scintillation). Solutions of oleic acid (0.2-1.6 mM in trichlorotrifluoroethane) were "tumbled" with adsorbent powder until equilibrated.

Adsorption onto alumina (Fig.1) shows high affinity (indicative of adsorption at energetic sites) but low capacity. The plateau value decreases linearly with increase in moisture content of alumina. This suggests oleic acid and water molecules compete for the same adsorption sites and that that hydrogen bonding is important for the adsorption interaction. This premise is supported by the work of Marshall & Rochester (1975) who found evidence for involvement of the $-\text{COOH}$ group in the adsorption interaction. Ottewill & Tiffany (1967) have shown evidence of multilayer adsorption of oleic acid and whilst not evident with alumina, adsorption onto micronised drugs did suggest existence of multilayers. This was most obvious for salbutamol base (Fig.2) and is explained in terms of a change in orientation of the oleic acid molecule at the particle surface, from horizontal to vertical (involving a cis to trans isomerism catalysed by the particle surface) and finally onset of multilayer adsorption. Isomerism allows orientation of the $-\text{COOH}$ and $-\text{CH}=\text{CH}-$ groups for surface interaction and IR spectroscopy (Marshall & Rochester, 1975) confirms olefinic group involvement in the adsorption interaction.



Kitahara, A. et al (1977) Colloid & Polymer Sci. 255: 1118-1121

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Ottewill, R. H., Tiffany, J. M. (1967) J.O.C.C.A. 50: 844-860