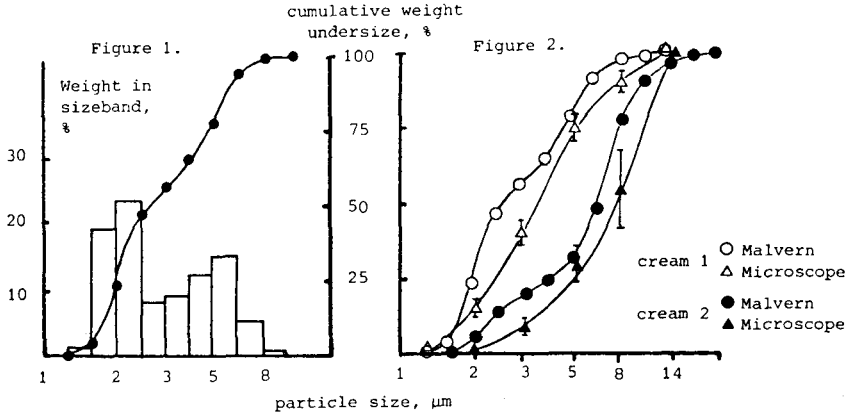
LASER DIFFRACTION AS A METHOD FOR THE PARTICLE SIZE ANALYSIS OF PHARMACEUTICAL EMULSIONS

R. Holtan and J.F. Pickard*, Pharmaceutical Research Department, A/S Apothekernes Laboratorium, P.O. Box 158, Skøyen, 0212-Oslo 2, Norway.

The principle of size analysis of pharmaceutical powders and aerosols by laser diffraction has been described by Brecevic and Garside (1981), Turner (1980) and Weiner (1979). This study has evaluated its use in the size analysis of pharmaceutical emulsions for topical use, in the size range 1 - 50μm as a potentially rapid and accurate alternative to the time-consuming and subjective microscopy method described in BS 3406 part 4. The laser diffraction system used was a Malvern 3600D and the microscope a Zeiss, standard 16.

The size distribution histogram obtained from the Malvern and the cumulative % weight distribution used to present the data, are illustrated in Figure 1. A sample dilution technique (either simple dilution with purified water 0.5:100, or purified water : ethanol 50:50), which does not adversely affect the product size distribution, was developed for the Malvern system. For a series of creams, the droplet size distribution from the Malvern and the microscope were compared. Typical results for two products of different composition (cream 1 contains virtually the same excipients as cetomacrogol cream BP, cream 2 contains a sulphated cetostearyl alcohol surfactant, water, arachis oil, urea and A - D vitamins) are shown in Figure 2. This shows good agreement between the methods, but illustrates that the laser diffraction system is able to characterise the bimodal distribution of the droplets, which is not detectable using the microscope.



The laser diffraction method has also been used to quantify the agglomerates of fine emulsion droplets found in certain creams. The study proposes methods of dispersing these agglomerates and estimating the size of their component oil droplets. The method has further been used to follow changes in oil droplet size distribution during manufacture of commercial products, illustrating its application as an in-process control technique. The Coulter Counter principle has been used frequently to measure the size of emulsion droplets, for example by Eberth and Merry (1983), and this study includes a comparison of this method with the Malvern system.

Brecevic, L. and Garside, J. (1981) Chem. Engng. Sci. 36: 867 - 869.
Eberth, K. and Merry, J. (1983) Int. J. Pharm. 14: 349 - 353.
Turner, K. (1980) Aerosol Age, September, 3 - 10.
Weiner, B.B. (1979) S.P.I.E. - Optics in Quality Assurance II, 170: 53 - 62.

*) present address: Pickard and Associates, P.O. Box 1, Stocksfield, Northumberland, NE43 7HD.