

High resolution measurements of dielectric cell properties by a combination of AC-electrokinetic effects.

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Abstract: *Dielectric single cell spectroscopy (DSCS) by AC-electrokinetics is based on electrokinetic methods such as electrorotation (ER), dielectrophoresis (DP) and electro-orientation (EO). Each method provides particular frequency spectra. Of course, the spectra are not independent of one another since each spectrum reflects the dielectric properties of the same object. In principle, all spectra can be predicted if the dielectric properties of the object are known. Unfortunately, this situation is unrealistic for biological cells. For a given cell species, we found that it is virtually impossible to reliably predict the spectrum of another method based on the dielectric parameters obtained from measurements by only one method [6]. In turn, the search for the electric properties of the compartments for a cell model with a given subcellular geometry will have greater success the more methods are employed. In experiments on chicken red blood cells, we found that a model which satisfactorily described the DP and ER spectra could only predict the EO behavior of the cells with large deviations. We believe that a combination of DSCS methods may contribute to a higher resolution in the exploration of the subcellular dielectric properties, and will also lead to a better understanding of the mechanisms of energy absorption in cells.*