ANALYSIS OF 2D GELS: A GLOBAL APPROACH

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Two-dimensional polyacrylamide gel electrophoresis is currently one of the techniques of choice to separate and display all the proteins expressed in a tissue. In the resulting protein maps for groups of patients, we seek to identify proteins that are differentially expressed. I will describe a comprehensive analytical approach that deals with preprocessing, alignment and differential analysis. Preprocessing removes the bulk of the background noise. It involves smoothing, selecting regions containing spots and gradient threshholding. Images are aligned using cubic-spline transformations. The alignment is formulated as a quadratic programming problem that is optimized using an interior-point method. Wavelets are then utilized to summarize the aligned images, and statistical tests performed on the wavelet coefficients. Alternatively, region-based tests are applied. These novel statistical tests were developed with the experimental design and low sample sizes in mind.