

Electronic-based Detection, Characterization and Quantification of Biological Molecules: Potential for Advanced Health-Care Analysis

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The state of a patient's health is assessed using a wide-range of measurements (e.g., temperature, mass and composition of the body; blood pressure; blood and urine analyses; histology) that are based on relatively old technologies. Modern advances in imaging and spectroscopy, which provide detailed views of internal tissue structure and the location of metabolites in the body, can help locate disease. However, their spatial resolution, sensitivity, and cost limit the generalized use of these measurement modalities. Although recent breakthroughs in molecular diagnostics are now used to detect cystic fibrosis, human papilloma virus, etc., there is still a need for sensitive and selective measurements that will routinely permit, at relatively low-cost, the early detection of cancers and other diseases. We will discuss how novel electronic-based methods for the detection, identification and quantification of biological molecules might eventually address these issues and aid our understanding of cellular and systems biology.