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Principle and Application of Protein Chip System

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Recently, protein chip system has attracted a great interest, since several protein chip systems and their biological applications have been reported. In addition, protein chip system does not require labeling biomolecules with fluorescent or radioactive materials to analyze.

Protein chip systems consist of a sensor chip, a detection system and a microfluid system (Fig. 1). Various types of sensor chips are developed by coating immobilization materials including carboxymethyl-dextran, disulfide chemicals, and calix-crown molecules on very thin gold film (about 500 Å). Most of protein chip systems, currently being commercialized, use surface plasmon resonance (SPR) as the detection principle (Fig. 1). The interaction of biomolecules with a biomarker on sensor chips are detected by the changes of SPR angle. The SPR response is dependent on the changes in refractive index at the sensor chip surface, which is caused by the binding of biomolecules on the sensor chip surface. Recently, mass spectrometry method has been applied to the detection system such as Surface-Enhanced Laser Desorption/Ionization (SELDI) technology. This system has an advantage in directly identifying biomolecules bound on censor chips.

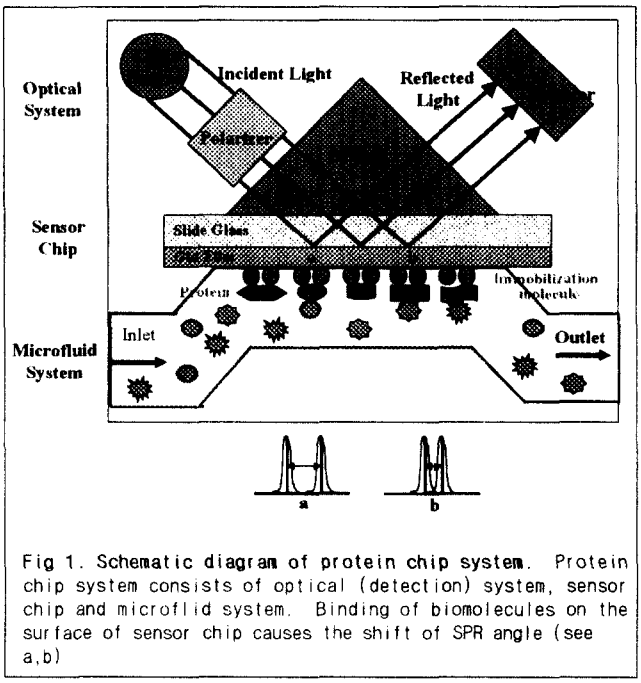

Fig 1. Schematic diagram of protein chip system. Protein chip system consists of optical (detection) system, sensor chip and microflid system. Binding of biomolecules on the surface of sensor chip causes the shift of SPR angle (see a,b)

Protein chip system has various biological applications, such as screening,

kinetic measurement of protein-protein interaction, concentration measurement, protein purification, and binding site analysis. In addition, the system can be used for identifying post-tranlational modification and processing of proteins, which are important in disease states. Recently, there are reports demonstrating new microanalysis approaches to discover potential biomarkers of various diseases including cancers (prostate, ovarian and bladder cancers) and Alzheimer's disease by the combined use of laser capture microdissection and protein chip system. Thus, protein chip system is a new system for integrated analsysis of biomolecules in Proteomic Era.