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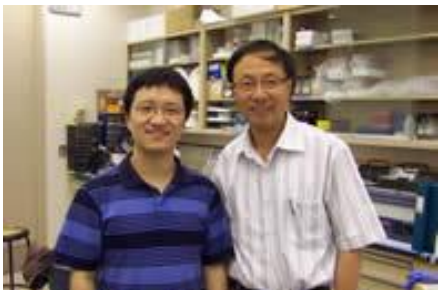

I obtained a BSc (2000) in Chemistry and PhD (2005) in Analytical Chemistry, both from Peking University, China. After my graduation, I joined Dr. X. Chris Le's group as a postdoctoral fellow in Division of Analytical and Environmental Toxicology, Department of Laboratory Medicine and Pathology. My research has included bioanalytical chemistry, electrochemistry, biosensors and separation techniques. Currently, I am focusing on developing bioanalytical technology for biomedical and diagnostic applications. A particular analytical advance results from the development of aptamer affinity probes for the separation and detection of minute amounts of proteins.

Proteins are essential components of organisms and are involved in a wide range of biological activities. There are increasing demand for separation and detection of trace levels of proteins because many proteins related to diseases (protein biomarkers) are present at low levels. It is a challenge to detect low levels of proteins because of interferences caused by the presence of abundant proteins in samples (e.g. blood samples). Using aptamers that can specifically bind to proteins, and a monolithic column, we developed aptamer-based affinity chromatography to achieve the separation and detection of minute amounts of proteins. Aptamers have advantages over antibodies, such as ease of preparation, lower cost, higher reproducibility and higher stability. Using aptamers as affinity probes for separation and detection, our techniques overcome the limitations encountered by the use of antibodies. A monolithic column consists of a single piece of rigid porous structure prepared by in-situ polymerization. Due to the porous nature of the monolith, monolithic columns have advantages over conventional packed columns; they have larger mass transfer and lower back pressure, enabling extremely fast separations. Therefore, our techniques offer benefits of high speed and high throughput analysis.

We demonstrated aptamer affinity chromatography in two main assay formats. With the first technique using one aptamer, the target proteins can be separated from the unretained proteins based on their different binding affinities to the immobilized aptamers. The selective capture of target proteins and subsequent rapid elution enabled a sensitive determination of target proteins. We further developed an affinity sandwich chromatographic technique using two aptamers of thrombin, and demonstrated its application to assay for thrombin, which is an enzyme in blood, regulating blood clotting. This sandwich assay improved the selectivity and sensitivity of thrombin detection. We were able to detect as low as 0.1 nanomolar of thrombin. These techniques can be applied to clinical analysis of a diverse range of targets that have aptamers of varying affinity. An important application is to develop new protein markers related to disease.