There is an urgent need for novel diagnostic methods capable of non-invasive, sensitive and feasible early prediction of colorectal adenoma-to-carcinoma progression over conventional techniques. In this paper, we describe for the first time the use of phage display for the identification of novel peptide motifs that specifically recognize colorectal cancer (CRC) biomarkers for the prediction of colorectal adenoma-to-carcinoma progression. We performed a biopanning of phage displayed peptide library to identify novel peptide sequences specific for promising CRC biomarker, LRG1 and TTR. The peptides specific for LRG1 that is upregulated proteins in carcinoma had an amino acid sequence with QHIMHLPHINTL, while the peptides specific for TTR that is downregulated proteins in adenoma had an amino acid sequence with VHDDFRQDWQPS. ELISA assays were used to evaluate binding affinity for their targets. As a consequence, both phage-displayed peptides were found to be sub-picomolar binding affinities for their proteins. A quartz crystal microbalance (QCM) is used as a diagnosis tool during biosensor development, and electrochemical techniques (cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS)) and surface-enhanced Raman scattering (SERS) are used as the detection methods in the biosensor. Overall these results demonstrate a simple platform for developing sensitive peptide-based biosensors for almost any desired protein target.

Figure 1 – Schematic description of the procedure for identification and characterization of peptide binders