

Peptide Chips for Diagnostic Seroanalytics

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The analysis of antibodies in serum is an established technique in the laboratory diagnosis of infectious as well as autoimmune diseases. Classical serological assays are based on immobilized antigens that serve to capture antigen specific antibodies from serum samples. Immunofluorescence assays, immunoblotting and ELISA formats are standard techniques for immunodiagnosis. Drawbacks of these methods are their dependence on purified native or recombinant protein antigens, their lack of simultaneous multiparameter analysis of the sample within a single assay, and their inability to differentiate the fine specificity of heterogeneous antibody populations.

The multitude of antibody reactions towards a pathogen and likewise the antibody profile in autoimmune diseases, however, does contain a wealth of proteomic (antibody) data that may constitute valuable diagnostic information with relevance for the patient's prognosis and response to therapy. Parallel detection of many different antibodies in a serum sample would be of great value in many areas of basic immunological research.

Peptide microarrays displaying biologically active small synthetic peptides in a medium to high-density format represent an attractive technology to probe complex samples for the presence of antibody analytes. We developed a peptide microarray for the parallel serodiagnosis of viral infections. In our approach, the primary sequences of immunodominant regions of viral antigens are represented by overlapping sequences of short synthetic peptides. The peptide probes are equipped with linker functions and site-specifically immobilized onto activated glass surfaces. The assay format is a fluorescence based sandwich assay in which antibodies from serum samples are captured between surface immobilized peptides and a fluorescence labeled secondary antibody.

We designed peptide microarrays for the immunodiagnosis of a variety of prevalent and clinically relevant viral pathogens, including different herpes virus and hepatitis virus species. The microarray results show a very high degree of correspondence in terms of specificity and sensitivity with serum specifications obtained with commercial ELISA Kits. Various viral species and subtypes can be reliably diagnosed in parallel. We therefore conclude that peptide microarrays may provide a basis for differentiated immunodiagnosis and the development of individualized therapy concepts.