

Scoping review of the applications of peptide microarrays on the fight against human infections

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Abstract

Introduction: This scoping review explores the use of peptide microarrays in the fight against infectious diseases. The research domains explored included the use of peptide microarrays in the mapping of linear B-cell and T cell epitopes, antimicrobial peptide discovery, immunosignature characterisation and disease immunodiagnostics. This review also provides a short overview of peptide microarray synthesis.

Methods: Electronic databases were systematically searched to identify relevant studies. The review was conducted using the Joanna Briggs Institute methodology for scoping reviews and data charting was performed using a predefined form. The results were reported by narrative synthesis in line with the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews guidelines.

Results: Ninety-five articles from 103 studies were included in the final data charting process. The majority (92.0%) of the articles were published during 2010-2020 and were mostly from Europe (44.2%) and North America (34.7%). The findings were from the investigation of viral (45.6%), bacterial (32.0%), parasitic (23.3%) and fungal (2.0%) infections. Out of the serological studies, IgG was the most reported antibody type followed by IgM. The largest portion of the studies (77.7%) were related to mapping B-cell linear epitopes, 5.8% were on diagnostics, 5.8% reported on immunosignature characterisation and 8.7% reported on viral and bacterial cell binding assays. Two studies reported on T-cell epitope profiling.

Conclusion: The most important application of peptide microarrays was found to be B-cell epitope mapping or antibody profiling to identify diagnostic and vaccine targets. Immunosignatures identified by random peptide microarrays were found to be applied in the diagnosis of infections and interrogation of vaccine responses. The analysis of the interactions of random peptide microarrays with bacterial and viral cells using binding assays enabled the identification of antimicrobial peptides. Peptide microarray arrays were also used for T-cell linear epitope mapping which may provide more information for the design of peptide-based vaccines and for the development of diagnostic reagents.