Journal of Chromatography B, 878 (2010) 113–114

Contents lists available at ScienceDirect

Journal of Chromatography B

journal homepage: www.elsevier.com/locate/chromb

Preface

Immunoaffinity techniques in analysis

The use of antibodies as selection agents for isolating and measuring specific analytes has been reported since the 1960s and led to the development of the classical immunoassay, wherein one antibody was used as a capture agent and a second antibody combined with a detectable label was used as the detection or reporter reagent. Following the development of the radio-immunoassay, the enzyme-linked immunoassay (ELISA) became one of the most popular immunological assays for measuring defined analytes in various fluids and tissues. However, neither of these assays allowed for the isolation of the analyte for further characterization or investigation, which led to a growing interest in applying the specificity of antibody–antigen reactions to the analytical and separation sciences. This interest focused on either developing immunoaffinity isolation procedures as an analytical technique in its own rights [1] or using antibody selectivity to isolate a specific analyte prior to further analysis. In the former case, the isolated analyte could be isolated and recovered, which is a distinct advantage over the ELISA technique in which the analyte is unrecoverable following the detection stage. In the latter case, the immunoaffinity step provided a specific cleanup prior to a more sophisticated analysis.

A major advantage of antibody-based separation techniques is the specificity that antibodies bring to the separation, enabling a single analyte to be isolated from complex biological or chemical matrices. Additionally, antibodies can be assembled as a panel capable of isolating multiple analytes simultaneously, which can then be separated and analyzed by a second technique such as high-performance liquid chromatography (HPLC), capillary electrophoresis (CE), or capillary electrochromatography (CEC). The advent of engineered antibodies i.e. monoclonal, bifunctional, and single chain antibodies has made an impact on the popularity of immunoaffinity techniques in both chemistry and biology. These antibodies have lessened the necessity of extensive and often complicated purification of animal serum or plasma to produce class specific polyclonal antibodies, often containing multiple specificities. Further, the use of high affinity antibodies has greatly sped up the initial antibody capture phase, thus shortening the time of the analysis. The combination of immunoaffinity techniques with other analytical processes, especially mass spectrometry has made considerable impact on biomedical research especially proteomics and biomarker discovery [2,3]. Immunoaffinity isolation has successfully been used in food analysis, toxicology [4] drug analysis and environmental monitoring [5].

The development of micro-fabricated devices employing immunoaffinity ligands is continually growing as are their applications [6]. Microfluidic devices are gaining popularity mainly due to the speed of the analysis, the reduced sample and reagent costs and in some cases ease of operation. Microfluidic mixers, chromatography and electrophoresis systems are commercially available and all can easily be converted into an analytical system with an immunoaffinity extraction prior to final analysis [7]. Additionally, a number of specialized instruments such as biosensors and immunosensors employ microfluidic devices to sped up analysis time and lessen reagent costs. The combination of antibody extraction with rapid micro-analysis coupled with the ever-expanding repertoire of antibodies available for analytical use leads to the development of field and clinical bedside analytical devices. Immobilized antibodies can also be employed as the capture ligand for the development of label-free analytical instruments.

This special issue will feature reviews and original research reports from experts in the field illustrating the use of immunoaffinity techniques to improve selectivity and sensitivity and biological analysis. The special issue is divided into five sections. Section one comprises of a series of reviews covering, immunoaffinity applications in food analysis, the combination of immunoaffinity and mass spectrometry, micro-immunoassays, analysis of antibodies by surface plasmon resonance, and immunoaffinity applications in centrifical precipitation chromatography.

The second section includes a number of original research reports describing applications of immunoaffinity separation as an analytical tool in its own right. The third section is composed of original research on the use of immunoaffinity extraction prior to mass spectrometry and the fourth section describes work on immunosensors, especially in combination with microfluidic devices. Finally, the last section describes the application of antibodies in the development of specific biosensors and label-free detection systems. Although this special issue does not cover the full extent of the applications of antibody-based techniques in the analytical sciences, it does give the reader a feeling for the scope of immunoaffinity is the analysis and I sincerely hope that it will encourage researchers to incorporate antibody-based isolation in their future research endeavors.

I wish to extend my sincere thanks to all of the contributors and reviewers for their outstanding contributions to the special issue. Additionally, I would like to thank the editors of the *Journal of Chromatography B* for giving me this opportunity to edit the special issue and the editorial office (especially Mr. Eduard Hovens) for their support and help throughout the development of the issue. Finally, I wish to extend my most sincere gratitude to the special issue editor, Dr. Dimitrios Tsikas for his continued advice, support and guidance throughout the entire process of assembling this special issue.

1570-0232/$ – see front matter. Published by Elsevier B.V.
doi:10.1016/j.jchromb.2009.12.001

References

[1] D.S. Hage, J. Chromatogr. B 715 (1998) 3.
[2] X. Fang, W.W. Zhang, J. Proteomics 71 (2008) 284.
[3] B.L. Ackermann, M.J. Berna, Expert Rev. Proteomics 4 (2007) 175.
[4] F. Pragst, Anal. Bioanal. Chem. 388 (2007) 1393.
[5] J.M. Van Emon, C.L. Gerlach, K. Bowman, J. Chromatogr. B 715 (1998) 211.
[6] M.C. Peoples, H.T. Karnes, J. Chromatogr. B 866 (2008) 14.
[7] N.A. Guzman, T. Blanc, T.M. Phillips, Electrophoresis 29 (2008) 3259.

Terry M. Phillips
National Institutes of Health, Bethesda, United States
E-mail address: phillipt@mail.nih.gov

Available online 4 December 2009