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Perspective

The Role of Lectin Affinity Chromatography in Purification of Cell Surface Glycoconjugates

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ABOUT THE STUDY

Lectin Affinity Chromatography (LAC) is a technique for purifying cell surface glycoconjugates in adequate numbers for structural elucidation investigations. It provides a number of benefits over traditional biochemical approaches for purifying glycoconjugates, such as immunoprecipitation and/or immune affinity chromatography. Serial LAC (SLAC) not only facilitates in determining a glycoprotein's identification or allows for the purification of a glycoprotein to homogeneity from a mixture of glycoproteins, but it also successfully resolves micro heterogeneity in these glycoproteins, which would otherwise be impossible to resolve. Specific examples of altered expression and maintenance of micro heterogeneity of specific glycoproteins in pathological situations compared to normal biology are examined. The use of LAC in (i) Itself, (ii) Serial, and (iii) Combination with other methods like as two-dimensional electrophoresis, capillary electrophoresis, mass spectrometry, and so on.

Lectins are multivalent non-immune proteins that bind to sugars with a high specificity, agglutinate cells, and have no enzymatic activity [1]. Lectins have become a paradigm for protein–carbohydrate recognition due to their capacity to detect small changes in carbohydrate structures seen on cell surface glycoproteins and glycolipids [2]. Lectins have been associated to defence against invading organisms, symbiotic association between nitrogen-fixing bacteria and the roots of leguminous plants, recognition of host cells by viruses, cellular adhesion, cellular recognition, cell growth and differentiation, history chemical detections of sugar chains on the cell surface, staining and structural estimation of electrophoretically separated membrane glycoconjugates, and separation of immunized cells, among other things. Because of their ability to specifically bind cell surface carbohydrates that play important roles in biological recognition, lectins have found a wide range of uses in recent years, including blood typing, cancer diagnosis and prognosis, elucidation of the architecture and dynamics of the cell surface carbohydrates, glycoconjugate purification, and structural characterization. The vast range of uses for lectins is due to their widespread distribution in nature and abundance in plants, particularly legume seeds, as well as the efficiency with which they may be purified to homogeneity and the large repertoire of carbohydrate specificities that they exhibit. Moreover, It's not surprising, that lectins have a wide range of uses in biology and medicine, including cell selection, blood type, oligosaccharide analysis, and preparative scale glycoconjugate separation (purification of glycoproteins) using affinity chromatography [3]. In phenomena like cellular signalling and intercellular signal transduction, cell surface glycoconjugates serve as surface markers that govern and determine cell–ligand and cell–cell interactions.

The structural elucidation of membrane glycoconjugates is crucial for studies addressing the molecular mechanisms of these actions. For this reason, sufficient amounts of glycoconjugates are required; their separation using standard techniques is challenging, and this is made more difficult by the presence of micro heterogeneities in them [4]. The fact that sugars have a lower affinity for lectins than carbohydrate-specific antibodies is extremely useful for developing purification procedures for glycoconjugates. If carbohydrate-specific antibodies are used as affinity ligands, unphysiologically harsh conditions must be used to elute the proteins that become adsorbed on the matrix during glycoconjugate purification; additionally, the biological activity of the proteins purified under such conditions cannot be guaranteed.

CONCLUSION

When immobilized and used as affinity ligands for the purification of the aforementioned glycoconjugates, however, lectins provide an advantage since only moderate conditions are required to elute the protein of interest. Furthermore, lectin purification is not as difficult as producing carbohydrate-specific monoclonal antibodies because of their widespread distribution and abundance.

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