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Perspective

Glycoproteins and Therapeutic Monoclonal Antibodies

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DESCRIPTION

Glycobiology is the study of carbohydrates, also known as glycan's, and their structure, function, and biology. Glycan's are found in all living things. Glycobiology is a rapidly expanding field of biology that has applications in biomedicine, biotechnology, and basic research. Glycan's perform numerous protective, stabilizing, organizing, and barrier functions. A significant physical barrier is formed by the glycocalyx that covers all eukaryotic cells and the polysaccharide coats of various prokaryotes. Glycoconjugates, that include glycoproteins, glycopeptides, peptidoglycans, glycolipids, glycosides, and lipopolysaccharides, are extremely important compounds in biology. They participate in cell-cell interactions, including cell recognition, as well as cell-matrix interactions and detoxification processes. The most abundant glycoconjugates found in mammalian cells are glycoproteins, proteoglycans, and glycolipids. They are mostly found on the outer cell membrane and in secreted fluids. Glycoconjugates have been shown to be important in cell-cell interactions due to the presence of various glycan binding receptors on the cell surface in addition to the glycoconjugates themselves. Glycans are sugar-based polymers that coat cells and decorate the majority of proteins, resulting in the formation of glycoproteins. They are essential for biological processes like immune regulation and intercellular communication. N-glycans at Asn-X-Ser/Thr sequons in eukaryote glycoproteins are classified into three genera: oligo mannose, complex, and hybrid.

Therapeutic monoclonal antibodies

Carbohydrate (sugar) molecules that are attached to proteins in cells. Glycoproteins are proteins that contain carbohydrate molecules. Glycan analysis is being researched to see if glycoproteins on cancer cells can be used as biomarkers.

The glycoproteins that make up therapeutic monoclonal antibodies (mAbs) are created by live cell systems. One of the most frequent Post-Translational Modifications (PTMs) of proteins is glycosylation. Protein stability, bioactivity, and immunogenicity can all be directly impacted by the glycan moieties joined to the proteins. In order to ensure product quality, glycosylation variations of a glycoprotein product must be properly evaluated and managed. Moreover, the enormous variety in glycan structure and content along with the inherent complexity of protein glycosylation give an extra level of difficult analytical challenge. Because oligosaccharides are isomeric and branching, determining the glycan structure is difficult. The conventional method uses exoglycosidases to release terminal monosaccharides progressively and selectively, resulting in trimmed glycans that may be examined using HILIC, CE, or MALDI-MS. The various analytical techniques such as High-Performance Liquid Chromatography (HPLC), Capillary Electrophoresis (CE), Mass Spectrometry (MS), Isoelectric Focusing (IEF), and lectin-based microarray which are categorised and discussed in accordance with how well they can be used to analyse intact glycoproteins, glycopeptides, released glycans, and monosaccharides.

High-Performance Liquid Chromatography (HPLC) and High-Performance Capillary Electrophoresis Analysis of Oligosaccharide Chains in Glycoproteins (HPCE). By using anion-exchange HPLC with pulsed amperometric detection, O- and N-glycosidically linked oligosaccharides liberated from glycoproteins can be recognised as their borohydride-reduced forms. By using HPCE in direct zone electrophoresis mode in an acidic phosphate buffer and zone electrophoresis mode as borate complexes in an alkaline buffer, N-glycosidically linked oligosaccharides can also be examined as 2-aminopyridine derivatives. The method that is most frequently employed for separating glycopeptides is liquid chromatography. The glycopeptides in bottom-up, sometimes referred to as shotgun proteomics, are created by the enzymatic breakdown of glycoproteins (usually by trypsin). After that, RP-LC, HILIC, or PGC are used to separate the resultant glycopeptides.

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