

The promise of glycoproteomics for studying cardiovascular disease

Abstract

The potential of glycoproteomics for analyzing proteins associated with cardiovascular diseases are discussed.

Keywords: glycoproteomics, extracellular matrix, myocardial infarction

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Editorial

Protein glycosylation, an enzyme-directed site-specific process, is one of the most common co-translational and post-translational modifications.¹ Glycoproteins modulate multiple biological processes, including cell adhesion and migration, signal transduction, and cell-cell communication.^{2,3} Despite its widespread importance, glycoproteomics is not commonly used for studying cardiovascular disease compared to other diseases, such as cancers and diabetes. Glycoproteomics has the potential to be a powerful tool for analyzing proteins associated with cardiovascular diseases, as discussed below.

- i. Glycosylation alters protein function by influencing protein folding, activity, stability, and distribution.⁴ Glycosylation is increasingly recognized for its importance in modulating cardiomyocyte function and survival.⁵
- ii. Glycoproteins are the major components of the cardiac extracellular matrix, including structural and non-structural proteins that play key roles in cardiovascular disease development.⁶ For example, thrombospondin, tenascin-C, and periostin are 3 nonstructural extracellular matrix glycoproteins that modulate cardiac remodeling after myocardial infarction.⁷⁻⁹
- iii. Since most cell surface and secreted proteins, including extracellular matrix proteins, are glycosylated, glycoproteomics is a useful enrichment strategy for the study of extracellular proteins.¹⁰⁻¹² Due to the extracellular location, these proteins are readily detected on cell surface or released into circulation, allowing them to serve as potential biomarkers and logical drug targets.¹³ Therefore, glycoproteomics is a good approach for biomarker discovery.
- iv. Glycoproteomics greatly reduces the sample complexity by focusing on glycosylated peptides instead of all protein peptides, which greatly improves the odds of the detecting low abundant proteins.^{14,15} Glycoproteome enrichment coupled with targeted mass spectrometry analysis, such as selected reaction monitoring (SRM), further improves the sensitivity of mass spectrometry-based assays.¹⁶

Glycosylation is a highly abundant modification crucial for the regulation of protein function, including proteolytic cleavage by enzymes and intra-protein interaction. Glycoproteomics is a logical approach to target specific subproteome with improved sensitivity for low abundant proteins. Therefore, glycoproteomics presents a new direction in methods that allow proteins associated with cardiovascular disease to be assessed for potential use as biomarkers or drug targets.

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Conflict of interest

The author declares no conflict of interest.

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