

Thematic Minireview Series on Glycobiology and Extracellular Matrices: Glycan Functions Pervade Biology at All Levels*

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Gerald W. Hart¹

From the Department of Biological Chemistry, The Johns Hopkins University School of Medicine, Baltimore, Maryland 21205-2185

Glycans represent one of the four fundamental building blocks of life, and they are the most abundant biological molecules on our planet. Only in recent years have we begun to appreciate how deeply glycan functions pervade all aspects of organismic biology, molecular biology, and biochemistry. A recent National Academy Sciences report has concluded that a better understanding of glycoscience is critical for advancement of human health and for sustainability on this planet. The report further concludes that efforts to study this key area of biochemistry/biology have substantially lagged behind investments in other biological molecules, such as nucleic acids and proteins. The *Journal of Biological Chemistry* continues to be the leader in publication of glycoscience research. In this special issue of the Journal, five minireviews, authored by leaders in glycobiology, illustrate the remarkable diversity of the biological functions of glycans.

Springer and Gagneux (1) review the critical roles that cell surface glycans play in our never-ending battle against infectious organisms. In all of evolution, there is no example of a cell that is not covered by glycans. The physical and chemical properties of glycans, including their complexity and structural plasticity, make them ideally suited to be at the “frontlines” of our constant evolutionary conflict with invading microbes. Nothaft and Szymanski (2) present an overview of current research on asparagine-linked *N*-glycosylation in bacteria, which not only

has important implications for prokaryote biology itself but also is leading to the use of these organisms to produce therapeutic glycoproteins in large quantities. Tran and Ten Hagen (3) review the essential roles of mucin-type (*N*-acetylgalactosamine linked to serine or threonine) *O*-glycans in protein secretion, stability, processing, and functions. Their overview highlights the critical importance of *O*-glycans in many aspects of development and in the etiologies of human diseases. Wells (4) reviews the complex pathway regulating a specific type of *O*-glycans, *O*-mannosylation, and how defects in these biosynthetic pathways lead to congenital muscular dystrophies, broadly referred to as “dystroglycanopathies.” Freeze (5) summarizes the recent advances in congenital diseases of glycosylation, which have provided a “Rosetta Stone” for elucidating the critical functions of glycans in human development.

Although these selected minireviews represent only a very small sampling of the myriad biological roles of glycans, they do illustrate clearly how glycans pervade biological functions at all levels of life on this planet.

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* This thematic minireview series is dedicated to the memory of Professor Robert L. Hill, a long-time associate editor of the *Journal of Biological Chemistry*, a major pioneer in glycosciences, and a friend and mentor to many of us.

¹ To whom correspondence should be addressed. E-mail: ghart@asmb.org.