Editor's LETTER

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A Glyco-mix of Approaches To Studying Carbohydrates

Glycans, including glycolipid and glycoprotein conjugates, are recognized to be involved in many important processes, including differentiation, protein folding, adhesion, and pathogenesis. In medicine, carbohydrates also form the basis for many therapeutic and diagnostic strategies. Yet much remains to be discovered about this large class of molecules.

The understanding of carbohydrate interactions and functionality has been greatly augmented through the use of glycomics—the systems-based study of glycans. In this issue, a survey of recent glycomic approaches is provided by Krishnamoorthy and Mahal (*1*). As with genomics and the genome, glycomics bears increasing fruit as the full complement of the glycome becomes known. Thus, the authors explore various chemical approaches for the isolation and identification of glycoproteins and their linked sugars. They further discuss strategies to analyze the interactions of glycans with proteins. Two prominent techniques are based on microarray technology—one in which lectins (a class of carbohydrate-binding proteins) are arrayed on a solid support, and another in which the glycans themselves are spotted on arrays.

One difficulty associated with the latter approach is that the glycans are often generated synthetically, and may not represent naturally occurring species. In this issue, Song *et al.* (*2*) describe a new method for the isolation and purification of glycans from natural sources. The utility of this approach is increased with the introduction of a fluorescent label to facilitate separation, purification, quantification, and characterization of the sugars.

Another review in this issue by Bernardes *et al.* (*3*) highlights additional advances in the study of glycans. Following the theme of microarray-based studies, the authors review methods for the enzymatic elaboration of immobilized glycans as well as the use of immobilized probes composed of lipids with carbohydrate modifications. They also present a host of techniques for the synthesis and conjugation of oligosaccharides that allow for the generation of homogeneous samples, of particular use in applications such as the creation of glycoconjugate vaccines.

The studies presented here highlight some of the recent advances that have been made in the area of glycomics. Though these tools have already begun to bear fruit, they remain underdeveloped relative to the fields of genomics and proteomics. Over the coming years, it will be exciting to observe these methods, and associated bioinformatic tools, mature and deliver a new level of understanding of these important molecules.

Eric Martens
Managing Editor, *ACS Chemical Biology*

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