
Preface

Carbohydrate microarrays have emerged in the late 1990s and early twenty-first century as a key technology for the deciphering of the glycospace. A carbohydrate microarray is a multiplex technology, where tens to hundreds of carbohydrate–protein interactions can be probed in parallel. Multiplexing is made possible, thanks to the immobilization of various carbohydrates at a discrete location on the surface of a material or on coded microspheres for example.

This book, dedicated to carbohydrate microarray, is aimed to give the reader the theoretical and experimental clues for the fabrication and implementation of carbohydrate microarrays. The fabrication of carbohydrate microarrays requires (1) to obtain the carbohydrate probes (monosaccharides, oligosaccharides, polysaccharides, glycoconjugates, or glycoclusters), (2) to immobilize these probes, (3) to implement the protocols for biological/biochemical interaction with the desired target.

Carbohydrate probes can be obtained from natural sources, by synthesis or are commercially available. The synthesis of oligosaccharides is beyond the scope of this book and requires specific skills. Nevertheless, an overview chapter is dedicated to glycochemistry as we felt that notions in the field are essential in particular for the introduction of derivatives (glycosides) for their immobilization. Indeed, immobilization of carbohydrates can be performed without further modifications of the carbohydrate or may require their conjugation with proteins, DNA, lipids, or the introduction of functional groups (thiol, amine, maleimide...).

Immobilization can be performed through weak interaction (van der Waals, ionic interactions), covalent bonding or biochemical reactions (streptavidin/biotin, DNA/DNA hybridization). These immobilizations can be performed directly on unmodified surfaces (thiol glycosides on gold surfaces for example) or on chemically prepared surfaces.

With the first two chapters, we have given an overview on carbohydrate microarray, carbohydrate chemistry. Chapter 3 is dedicated to sialic acids which display special biological and chemical properties. The following chapters deal with experimental protocols that present immobilization of various carbohydrates (oligosaccharides, glycoproteins, glycolipids, and polysaccharides) on different substrates (gold, glass, polymers...). Protocols span from the “straight forward” adsorption of unmodified polysaccharides/glycoconjugates from natural sources on commercial substrates to the synthesis of glycosides and their subsequent immobilization on chemically modified surfaces. Some materials used in certain protocols, such as glycosides or chemically modified surfaces are commercially available.

Similarly, we have tried to illustrate different detection techniques (Mass Spectrometry, Surface Plasmon Resonance, Dual Polarization Interferometry, Fluorescence...) and applications (from lectin/carbohydrates applications to serum antibodies profiling, serodiagnosis, enzymes, whole viruses...).

Hopefully, the catalogue of protocols will span most of the reader needs/applications.

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Ecully, France

Yann Chevolot

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