Preface

Serum-based cancer and disease biomarkers are essential in addressing the agendas faced in the personalized, the translational, or the integrated modern medicine. Four major types of biomolecules are glycans, proteins, nucleic acids, and lipids. Glycans contain far more structural information than that are carried by protein, nucleic acid, and lipid combined. Coincidentally, aberrant glycan structures or aberrant glycan-associated glycoproteins are identified as the serum cancer biomarkers and used clinically. During the past 30 years, the high false-positive and false-negative clinical results constantly challenge the meaning and the reliability of these glycan-related cancer biomarkers. However, very few serum cancer biomarkers have been introduced into clinical practice even with the advancement of the OMICS technologies not limited to genomics, epigenomics, proteomics, glycomics, lipidomics, and metabolomics. The reason is that most of the newly discovered cancer biomarkers are inferior in terms of sensitivity and specificity to these cancer biomarkers.

To understand the meaning and to reevaluate the reliability of the glycan-based cancer biomarkers, we looked over the major development in glycan research and glycan-related biomarker discoveries (Chapter 1), discussed three critical biological issues of glycan-based biomarkers (Chapters 2–4), and summarized the reported sensitivities and specificities of the glycan-related cancer biomarkers (Chapter 5). Most importantly, the serum levels of 17 glycan-related biomarkers including 10 cancer biomarkers, i.e., SCCA, CA724, CA50, CA242, CA125, CA199, CA153, AFP, CEA, and PSA, were retrospectively analyzed based on clinical laboratory data in two medical centers during the past 6 years (2012–2018). The data included a total of 1,477,309 clinical lab test results of the 17 biomarkers from healthy controls and patients suffering from 64 different types of cancer and noncancer diseases (Chapters 6–23). We found that the median serum levels of CA724, CEA, CA153, SCCA, and CA125 were highest not in cancer patients but in patients suffering from gout, lung fibrosis, nephrotic syndrome, uremia, and cirrhosis, respectively. Even though the median serum levels of CA50, CA242, and CA199 were highest in patients suffering from pancreatic cancer, all three antigens are glycan structures found in almost every epithelium of human tissues, suggesting that pancreatic cancer caused the most severe leakage of epithelial products into

the blood circulation among other cancer and noncancer diseases. Thus, the increased serum levels of cancer biomarkers represented the miscommunications between blood circulation and epithelia or systems malfunction associated with cancers and other noncancer diseases. Therefore, the clinically used glycan-related cancer biomarkers were valid indicators of systems malfunction for both cancer and other noncancer diseases.

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