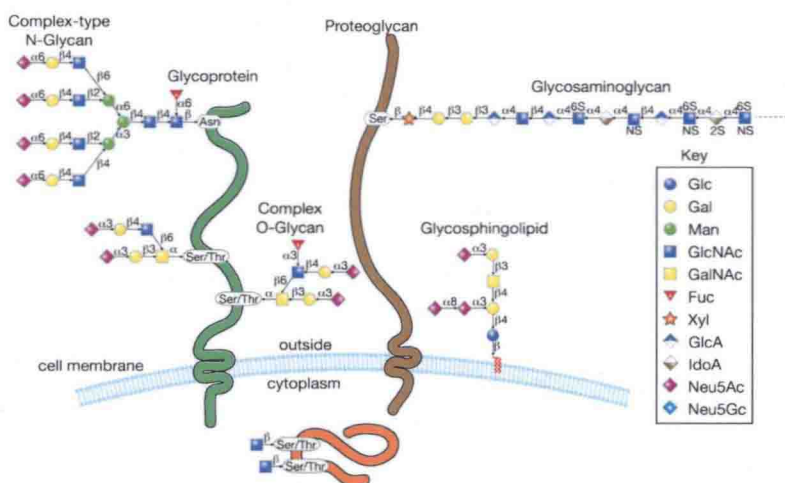


# ADVANCES IN CANCER RESEARCH

## VOLUME

126



# GLYCOSYLATION AND CANCER

*Edited by*  
**Richard R. Drake**  
**Lauren E. Ball**





VOLUME ONE HUNDRED AND TWENTY SIX

# ADVANCES IN CANCER RESEARCH

## Glycosylation and Cancer

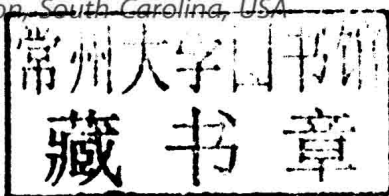
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VOLUME ONE HUNDRED AND TWENTY SIX

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Glycosylation and Cancer



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## PREFACE

The study of the glycome, which is comprised of all the constituent simple and complex glycans (or carbohydrates) of a cell, continues to lead to identification of new roles of glycans in the functioning of the immune system, extracellular matrix, cell–cell adhesion, and recognition processes, and protein folding and activity. It is well documented that malignant transformation and cancer progression result in fundamental changes in the glycosylation patterns of cell surface and secreted glycoproteins. This is underscored by the fact that the majority of current FDA-approved tumor markers are glycoproteins or glycan antigens. The goal of this volume of *Advances in Cancer Research* is to provide a current overview of the cancer research being done on the function of N-linked, O-linked, and O-GlcNAc glycans. Unique to this volume is the subsequent focus of individual chapters on what is known about glycosylation in relation to specific organ sites of cancer. A brief overview of the volume and highlights of different research opportunities and emerging areas of glycosylation and cancer is provided in Chapter “Glycosylation and Cancer: Moving Glycomics to the Forefront” by Drake. In the next three chapters, leading investigators at the forefront of current cancer research have provided summary chapters on the function of N-linked glycans (Chapter “Glycans and Cancer: Role of N-Glycans in Cancer Biomarker, Progression and Metastasis, and Therapeutics” by Taniguchi and Kizuka), O-linked glycans (Chapter “Simple Sugars to Complex Disease—Mucin-Type O-Glycans in Cancer” by Kudelka et al.), and O-GlcNAc modifications (Chapter “Intracellular Protein O-GlcNAc Modification Integrates Nutrient Status with Transcriptional and Metabolic Regulation” by Nagel and Ball). The other chapter contributors were requested to summarize the functions and research progress made for the roles of glycosylation in specific types of cancers, including pancreas (Chapter “The Detection and Discovery of Glycan Motifs in Biological Samples Using Lectins and Antibodies: New Methods and Opportunities” by Tang et al.), colon (Chapter “Glycosylation Characteristics of Colorectal Cancer” by Holst et al.), ovarian and breast (Chapter “Glycosylation and Liver Cancer” by Mehta et al.), brain and lung (Chapter “Functional Impact of Tumor-Specific N-Linked Glycan Changes in Breast and Ovarian Cancers” by Guo and Abbott), liver (Chapter “Glycosylation Alterations in Lung and

Brain Cancer” by Lemjabbar-Alaoui et al.), and prostate (Chapter “Altered Glycosylation in Prostate Cancer” by Drake et al.). Inclusive within these chapters are descriptions of the latest cutting-edge technologies used in cancer glycomic studies. We believe this collective volume will provide a detailed summary of the advances in glycosylation in cancer research, and provide incentive for continued study of this critical modification to improve our understanding of oncogenesis and impact the development of better targeted cancer diagnostics and therapeutics.

RICHARD R. DRAKE  
LAUREN BALL

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# Glycosylation and Cancer: Moving Glycomics to the Forefront

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## Abstract

There is a long research history of studying the function of glycosylation in relation to the development and progression of different types of cancer. The technological advances of the "omic" have in the last decade have afforded many new opportunities and approaches for studying the cancer glycome. A collection of research articles has been assembled that collectively summarize the progress in this area for each type of major O-linked and N-linked glycan species and other classes of glycans, as well as what is known about specific glycans associated with individual types of cancer (brain, breast, colon, liver, lung, ovarian, pancreatic, prostate). These chapters also include descriptions of the latest cutting-edge technologies that have been developed recently for cancer glycomics studies. An introduction to these topics and highlights of emerging areas of research opportunity for cancer glycomics are presented. This includes the development of new glycomics-based cancer biomarkers and therapeutic targets, as well as different integrated cancer "omics" strategies.



## 1. INTRODUCTION

The unprecedented progress in the analysis of the human genome, epigenome, transcriptome, and proteome continue to drive new discoveries in the biomedical sciences, leading to advancements in our understanding of human disease processes. While the fundamental relationship of DNA to