Preface

Introduction to Mucin Biology and Technical Challenges of Mucin Research

Epithelial mucins are large complex cell surface and secreted glycoproteins produced by mucosal epithelial cells. Mucins are a major component of the interface between the external world and mucosal tissues, where they provide lubrication, hydration, and a biological and physical barrier to potential toxins, particles, and pathogens. Mucins provide many challenges to researchers due to their large size, complex biochemical nature, and the viscous gels that they form when secreted. Overcoming these challenges is centrally important to a full understanding of mucosal biology and the contribution of mucins to normal human physiology and disease. In this volume of the *Methods in Molecular Biology* series, we have highlighted the technical challenges while describing procedures that are specifically relevant to the analysis of mucins and their contribution to mucosal biology. We have gathered a group of experts together to overview the best approaches to analysing each specific area of mucin biochemistry, physiology, and biophysics before providing individual detailed experimental protocols together with troubleshooting and interpretation tips. We have avoided detailing methods where the analysis of mucins is consistent with standard approaches for other proteins. The volume is designed to be a useful resource for those entering the mucin field and to facilitate those already studying mucins to broaden their experimental approaches to understanding mucosal biology.

The initial three chapters deal with the complexities of working with mucin genes, the challenges of the isolation and biochemical analysis of mucin glycoproteins and methods for detecting and quantifying mucins. The next two chapters concern detection of mucin core proteins by mass spectrometry and techniques for identifying sites of *O*-glycosylation on the mucin core proteins. These are followed by two chapters concerning the analysis of the biosynthesis of secreted mucins and the synthesis and intracellular trafficking of the cell-surface mucins. Then, there are three chapters that focus on the use of mass spectrometry-based methodologies to analyze the complex and diverse *O*-glycans present on mucins. The book then changes focus to methods used to assess mucus and mucin physiology and pathophysiology beginning with a chapter detailing methods for analyzing degradation of mucins. Then, there are three chapters concerned with assessing mucus in situ, including in vivo measurement of mucus thickness and production. This is followed by chapters describing the culture of mucus-producing human bronchial epithelial cells and techniques for assessing mucus production and secretion by those cultures. The last three chapters describe methods for assessing mucins in vitro and in vivo in the context of pathophysiology including infection.

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