
Preface

This volume presents detailed recently developed protocols ranging from isolation of nuclei to purification of chromatin regions containing single genes, with a particular focus on some less well-explored aspects of the nucleus.

The methods described include new strategies for isolation of nuclei, for purification of cell type-specific nuclei from a mixture, and for rapid isolation and fractionation of nucleoli. For gene delivery into and expression in nuclei, a novel gentle approach using gold nanowires is presented. The developing interest in analysis of specific regions of chromatin is illustrated by protocols for the isolation and structural and proteomic analysis of chromatin containing a single gene or containing newly synthesized DNA. A widely used method to purify chromatin regions is immunoprecipitation (ChIP), but during isolation chromatin structure may be modified by DNA damage response systems, and conditions which allow these artifacts to be avoided are described.

The concentration and localization of water and ions are crucial for macromolecular interactions in the nucleus, and a new approach to measure these parameters by correlative optical and cryo-electron microscopy is described. Similarly, redox conditions in the nucleus have been little explored, and a method to follow the redox dynamics of nuclear glutathione is an important step in this direction.

An important aspect of analyzing images of nuclear structures is the extraction of quantitative information, and this volume presents methods and software for high-throughput quantitative analysis of 3D fluorescence microscopy images, for quantification of the formation of amyloid fibrils in the nucleus, and for quantitative analysis of chromosome territory localization.

The friendly and timely collaboration of the contributors to this volume is greatly appreciated.

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