
Preface

The field of cell cycle regulation is based on the observation that the life cycle of a cell progresses through several distinct phases, G1, M, S, and G2, occurring in a well-defined temporal order. Details of the mechanisms involved are rapidly emerging and appear extraordinarily complex. Furthermore, not only is the order of the phases important, but in normal eukaryotic cells one phase will not begin unless the prior phase is completed successfully. Checkpoint control mechanisms are essentially surveillance systems that monitor the events in each phase, and assure that the cell does not progress prematurely to the next phase. If conditions are such that the cell is not ready to progress—for example, because of incomplete DNA replication in S or DNA damage that may interfere with chromosome segregation in M—a transient delay in cell cycle progression will occur. Once the inducing event is properly handled—for example, DNA replication is no longer blocked or damaged DNA is repaired—cell cycle progression continues. Checkpoint controls have recently been the focus of intense study by investigators interested in mechanisms that regulate the cell cycle. Furthermore, the relationship between checkpoint control and carcinogenesis has additionally enhanced interest in these cell cycle regulatory pathways. It is clear that cancer cells often lack these checkpoints and exhibit genomic instability as a result. Moreover, several tumor suppressor genes participate in checkpoint control, and alterations in these genes are associated with genomic instability as well as the development of cancer.

Cell Cycle Checkpoint Control Protocols is designed to augment the growing field and, through detailed descriptions of cell cycle-related methodologies using mammalian, yeast, and frog model systems, aid in the performance of experiments that bear on furthering the understanding of cell cycle checkpoint control. Chapters include descriptions of methods to induce cell cycle checkpoints, detect changes in cell cycle progression, identify and analyze genes and proteins that regulate the process, and characterize chromosomal status as a function of cell cycle phase and progression. The list of protocols is by no means complete, yet is comprehensive enough to at a minimum describe major methodologies used by investigators in the field.

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