
Preface

The ability to detect and quantify apoptosis, to understand its biochemistry, and to identify its regulatory genes and proteins is crucial to biomedical research. In this second edition of *Apoptosis in Methods in Molecular Biology*, expert researchers describe the techniques to best investigate the critical steps involved in the apoptotic process.

These readily reproducible step-by-step instructions are presented from several different research perspectives. The first part of the book provides an overview on the general techniques to detect apoptotic cell death, including methods such as caspase activity measurement, flow cytometry, live cell imaging, histopathology, and apoptosis detection in cell-free systems. In contrast, the second part lists methods to assess two forms of non-apoptotic cell death, necroptosis and autophagy.

Apoptotic proteins often undergo posttranslational modifications that alter their activity toward their downstream substrates. Techniques are described to analyze transglutamination, S-nitrosylation, and redox modifications of apoptotic proteins. Subsequently, several chapters are devoted to techniques that help dissect the major regulatory pathways of cell death and survival, including p53-dependent and independent and cell cycle regulatory proteins; the role of mitochondrial membrane permeabilization, unfolded protein response and ER stress, uncoupling protein-2, and microRNAs in programmed cell death; as well as the mechanism of phagocytosis by macrophages.

The fifth part of the book contains specific methodology required to evaluate apoptosis in various organs such as central nervous and cardiovascular system, myeloid progenitor cells as well as skeletal muscle. Techniques to detect apoptotic cell death during mammalian development are also described here. The final part of the book summarizes the approaches to study apoptosis in nonmammalian model organisms such as yeast, *Drosophila*, and *Caenorhabditis elegans*.

The protocols follow the *Methods in Molecular Biology* series format, each of them offering detailed laboratory instructions, an introduction outlining the principle behind the technique, lists of equipment and reagents, and tips on troubleshooting on how to avoid common pitfalls.

Apoptosis: Methods and Protocols, Second Edition, constitutes a key technical reference to the significant methodologies used in the field, and offers beginners and experienced researchers powerful tools to illuminate the phenomena of programmed cell death.

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Peter Erhardt
Ambrus Toth