Advances in Biochemical Engineering/Biotechnology

Managing Editor: T. Scheper
Advances in Biochemical Engineering/Biotechnology reviews actual trends in modern biotechnology. Its aim is to cover all aspects of this interdisciplinary technology where knowledge, methods and expertise are required for chemistry, biochemistry, microbiology, genetics, chemical engineering and computer science. Special volumes are dedicated to selected topics in which the interdisciplinary interactions of this technology are reflected. New biotechnological products and new processes for synthesizing and purifying these products are at the center of interest. New discoveries and applications are discussed.

In general, special volumes are edited by well known guest editors. The managing editor and publisher will however always be pleased to receive suggestions and supplementary information. Manuscripts are accepted in English.

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Apoptosis is one of the two mechanisms by which cells die. Its role has been widely recognised in many of the industrialised world’s major diseases such as cancer, immune system and neurodegenerative disorders and heart disease. The importance of apoptosis in cell culture and biopharmaceutical production has also been widely recognised and the goal of discerning its regulation is worth pursuing. The intellectual challenge and rewards are enormous, and are reflected in the 8100 papers on apoptosis published in the past three years.

Apoptosis (programmed cell death) is now defined as “a single deletion of scattered cells by fragmentation into membrane-bound particles which are phagocytosed by other cells” (Stedman’s Medical Dictionary, 1995). The morphological features of apoptosis are quite distinct from necrotic cell death which typically occurs when cells are exposed to such severe stress that cell survival become impossible. These features include condensation of nuclear chromatin, fragmentation of DNA into oligonucleosomal fragments, cell shrinkage and the formation of membrane-bound “apoptotic bodies”.

The chapters in this volume are intended to review the state-of-the-art with in-depth assessments of apoptosis. The aim of the volume is to make the recent developments in apoptotic research readily accessible to biotechnologists and biochemical engineers. The implication of apoptosis in the suppression of cancer and viral infection is presented to indicate the great potential of apoptotic research for the development of human therapies.

In this volume the characteristics and significance of apoptosis are highlighted. Biochemical and morphological changes during apoptosis and the methods used to detect these changes are described to give the reader useful information on how to use techniques such as fluorescence microscopy and flow cytometry to obtain quantitative data on apoptosis. A large part of this volume focuses on the genetic regulation and mechanisms of apoptosis, with emphasis on the identification of the key molecular sensors, mediators and modulators in apoptotic pathways and characterisation of their roles. Throughout the chapters a wide variety of both physiological and non-physiological agents that can induce apoptosis are revealed. Conversely, the role of survival factors in suppression of apoptosis is illustrated in a separate chapter with emphasis on the role of insulin-like growth factor and its receptor. The chapter on tissue transglutaminase describes the role of this effector element in the death pathway. The last chapter is dedicated to highlighting the progress and opportunities in the field of cell
culture engineering. The strategies that have been undertaken to prevent the induction of apoptosis in cell culture and those which have been suggested as possibilities to improve culture productivity through the apoptosis route are discussed with given examples.

Birmingham, UK
February 1998

Mohamed Al-Rubeai
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