Preface

In this volume are described methods for preparation of serum-free, hormonally defined media for transformed and untransformed fibroblasts and a number of types of differentiated epithelial cells. Investigations of tissue-specific functional expressions by epithelial cells are one of the most active areas of research in molecular and cell biology, and the development of serum-free, defined media for these cell types has had considerable impact on the field. Striking examples of the new types of studies accomplished by culturing epithelial cells in defined media are those in this volume describing the functional state of cultured kidney tubule epithelium. Different combinations of hormones and other factors can be shown to promote expression of either proximal or distal tubule functions selectively. Serum-free culture methods also are described for organ culture of developing kidney. Studies of hormone-responsive transport mechanisms as well as studies of the factors altering the states of kidney cell differentiation are open to new approaches using the methods outlined.

In addition to kidney, methods for preparing primary cultures of normal, functional hepatocytes are described; these will provide interested workers with a starting point for further investigation of the complex regulation of growth and gene expression in these cells in a defined environment. Also examined in this volume is the serum-free culture of epithelia from the lung; in this case, defined media have been used successfully to grow cell types that are readily lost when cultured in serum-containing medium. Well-defined cultures of lung epithelium from human and other species will facilitate the study of carcinogenesis in this tissue. Chapters describing growth of both human lung and colon carcinoma point out the experimentally-proven potential of the use of serum-free medium in the growth of human tumor cells from biopsy samples for drug screening.

Additional detailed methods are given in the first section for the serum-free culture of two cell types that may be of interest to a broad audience. The A431 human epidermoid carcinoma line, widely used recently in studies of epidermal growth factor effects and growth factor-receptor interactions, is finding use in other types of studies, including those dealing with extracellular matrix production (See Volume 1). Methods for growth of several lines of differentiating embryonal carcinoma, an obvious choice for a model system in the study of control of cell differentiation, are also reviewed. For those investigators requiring formulations for differentiated epithelial cell types not described in these volumes, application of the methods presented with lung, colon, and kidney tissue will provide a useful starting point. Information provided in Volume 1 of this series will provide methods of preparation of some of the basic components of the defined media used with the epithelial cells.

In the second part of this volume, methods for serum-free culture of fibroblasts are detailed, with an emphasis on those systems and techniques applicable to studies of growth control and malignancy in vitro. Included is an introductory chapter (reprinted from Prog. Clin. Biol. Res., Vol. 66) that provides an overview of the use of serum-free cell culture in the study of proliferation in vitro, as well as detailing serum-free culture conditions for lines of transformed and untransformed fibroblasts. With methods described in this section, a variety of applications are possible. Several approaches are described for the use of serum-free cell culture as a selection process for isolating cell variants. Also presented in this volume are methods for isolation and purification of brain- and pituitary-derived fibroblast growth factors. Methods for preparation of both the acidic and basic forms of these polypeptide factors are described in detail, and provide the interested investigator not only with access to those preparations, but also with outlines of how one goes about attempting the successful isolation of new factors that may be required for cell growth.

Applications of the methods described here are direct for several of the major cell types of the body. With some thought and experimentation, these formulations, and the methods of approach that they represent, should be applicable to other cell types as well.

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