



Preface

This, the fifth edition of *Culture of Animal Cells*, is structured in a similar style to previous editions, but with some significant changes. A new chapter has been introduced, Chapter 2, Training Programs, designed to enhance the use of this book as a teaching manual in addition to its role as a reference text. Chapter 2 sets out suggested programs for training new staff or students and adds experimental and analytical elements to some of the protocols to make the learning experience more interesting, more informative, and a little more challenging.

The cross-referencing has been extensively revised and updated. Individual sections now have numbers that incorporate the chapter number. A binomial, e.g., 4.1, cross-refers to Chapter 4, Section 1 and a trinomial, e.g., 14.6.2, would refer to Chapter 14, Section 6, Subsection 2, so the first digits, cross-referring to text, tables, or figures, will always refer to the chapter number. In part, this is designed to facilitate hyperlinking in the future electronic version of this book, which should appear on the Wiley website, www.wiley.com, shortly after publication of the paper edition.

The number of color plate pages has been doubled and, in combination with an extended Figure 16.2, now provides photographs of around 40 different cell lines, plus primary cultures, equipment and processes. I am greatly indebted to Yvonne Reid and Greg Sykes of ATCC, Peter Thraves of ECACC, and many others for kindly providing new illustrations; I hope that this will encourage readers to look at their cells more carefully and become sensitive to any changes that occur during routine maintenance.

For most of the book, I have retained the emphasis of previous editions and focused on basic techniques with some examples of more specialized cultures and methods. These techniques are presented as detailed step-by-step protocols that should give sufficient information to carry

out a procedure without recourse to the prime literature. There is also introductory material to each protocol to explain the background and supplementary information to provide alternative procedures and applications. Some basic biology is explained, but it is assumed that the reader will have a little knowledge of anatomy, histology, biochemistry, and cell and molecular biology. The book is targeted at those with little or no previous experience in tissue culture, including technicians in training, senior undergraduates, graduate students, postdoctoral workers, and clinicians with an interest in laboratory science.

Specialized techniques are now all contained in one chapter, as it does not seem entirely logical to separate molecular techniques from the others as the boundary is not distinct. The molecular techniques that are included are all seen as having direct relevance to cell culture. No attempt has been made to present basic molecular methodology, as these are already available [e.g., Sambrook et al., 1989; Ausubel et al., 1996, 2002]. Similarly, the chapter on scale-up serves as an interface with biotechnology and provides some background on systems for increasing cell yield, but takes no account of full-scale biopharmaceutical production processes.

The suppliers list has been updated and, hopefully, will remain so at the time of publication. However, company names change, mergers occur, and some suppliers disappear, so it is difficult to maintain currency. Again, it is hoped that, in the future, this will be accomplished more effectively on the website.

Abbreviations used in the text are listed separately after the preface. Conventions employed throughout are D-PBSA for Dulbecco's PBS without Ca^{2+} and Mg^{2+} and UPW for ultrapure water, regardless of how it is prepared.

Concentrations are given in molarity wherever possible, and actual weights have been omitted from the media tables on the assumption that very few people will attempt to make up their own media, but will, more likely, want to compare constituents, for which molar equivalents are more useful.

Protocols are identified in the text by boxing and shading of the text. Reagents that are specific to a particular protocol are detailed in the materials sections of the protocols, the recipes for the common reagents, such as Hanks' BSS or trypsin, are given in Appendix I. Details of the sources of equipment and materials are given in Appendix II, and the contact details of suppliers and other resources are given in Appendix.

As always, I owe a great debt of gratitude to the authors who have contributed protocols, and to others who have advised me in areas where my knowledge is imperfect including Robert Auerbach, Bob Brown, Kenneth Calman, Richard Ham, Rob Hay, Stan Kaye, Nicol Keith, Wally McKeethan, Rona McKie, Stephen Merry, Jane Plumb, Peter Vaughan, Paul Workman, Roland Grafström, and the late John Paul. I am fortunate in having had the clinical collaboration of David I. Graham, David G. T. Thomas, and the late John Maxwell Anderson. In the early stages of the preparation of this book I also benefited from discussions with Don Dougall, Peter del Vecchio, Sergey Federoff, Mike Gabridge, Dan Lundin, John Ryan, Jim Smith, and Charity Waymouth. I am eternally grateful to Paul Chapple who first persuaded me that I should write a basic techniques book on tissue culture and who, more recently, suggested the development of this text into a multimedia presentation, now published by Wiley-Liss. Many of the original illustrations were produced by Jane Gillies and Marina LaDuke, although many of these have now been replaced

due to the demands of electronic publishing. I am grateful to the Cancer Research UK Beatson Laboratories for allowing me to take photographs of many of the pieces of equipment that I have illustrated in this book. Some of the data presented were generated by those who have worked with me over the years including Sheila Brown, Ian Cunningham, Lynn Evans, Margaret Frame, Elaine Hart, Carol McCormick, Alison Mackie, John McLean, Alistair McNab, Diana Morgan, Alison Murray, Irene Osprey, Mohammad Zareen Khan, and Natasha Yevdokimova.

I have been fortunate to receive excellent advice and support from the staff of John Wiley & Sons. I would also like to acknowledge with sincere gratitude all those who have taken the trouble to write to me or to John Wiley & Sons with advice and constructive criticism on previous editions. It is pleasant and satisfying to hear from those who have found this book beneficial, but even more important to hear from those who have found deficiencies, which I can then attempt to rectify. I can only hope that those of you who use this book retain the same excitement that I feel about the future prospects emerging in the field.

I would like to thank my daughter Gillian and son Norman for all the help they gave me in the preparation of the first edition, many years ago, and for their continued advice and support. Above all, I would like to thank my wife, Mary, for her hours of help in compilation, proofreading, and many other tasks; without her help and support, the original text would never have been written and I would never have completed this revision by the assigned deadline, nor attained the necessary level of technical accuracy that is the keynote of a good tissue culture manual.

Ian Freshney