# Keys to production

## Membrane Protein Expression Systems: A User's Guide

*edited by Gwyn W. Gould, Portland Press, 1994. £29.50 (310 pages) ISBN 1 85578 031 3*

**Lawrence S. Mathews**

Dept of Biological Chemistry, University of Michigan, Ann Arbor, MI 48109-0606, USA.

Given the explosion in the number of cloned genes over the past decade, many researchers now find themselves needing to master an increasing number of techniques to explore their systems fully. Central to many investigations is the production of recombinant proteins, in order to generate sufficient material for biochemical or biophysical studies, including analyses of structure–function relationships. The goal of this methods book is to provide a straightforward introduction to the production of heterologous proteins using a variety of systems, including bacteria, yeast, baculovirus, vaccinia virus, and *Xenopus* oocytes. The production of membrane proteins presents an additional set of problems because of the hydrophobic nature of the membrane-spanning segments, so the authors have emphasized methodologies appropriate for those challenges; however, the principles of the various techniques are applicable to a wide variety of proteins.

Each chapter is devoted to a specific expression system, providing some background to the system, a discussion of the properties of the system, and a set of detailed protocols. The techniques are clearly described and are presented in good detail; information on suppliers and the sources of strains and vectors is generally helpful, although not complete (the purpose of listing unpublished vectors, with no information on the source, is unclear). Half of the chapters conclude with a troubleshooting section; unfortunately, these cover only a limited number of potential problems, and provide mostly cursory analysis.

There is a substantial amount of useful information here, but the book's value would have been enhanced by an overview of the various heterologous expression systems that are described. The introductory chapter by Lever *et al.* provides a cogent analysis of some of the issues pertaining to the purification and functional and structural analysis of integral membrane proteins. What it does not provide is an objective comparison of the different systems, summarizing the advantages/disadvantages of each with respect to the kinds of experiments you might wish to perform with a particular membrane protein. Researchers wishing to assess the physiological consequences of overproduction of a hormone receptor are clearly not going to turn first to *E. coli*, but could have difficulty deciding whether traditional DNA transfection protocols or expression using vaccinia virus is better suited for their protein (expression using retroviral vectors is not discussed). Although each chapter starts with a discussion of some considerations in using that system, the depth of that analysis is spotty, and the reader who wants to evaluate the options will need to do some digging. The book would thus benefit from the inclusion of a set of criteria that would enable someone skilled in the analysis of a particular protein but lacking experience in recombinant overexpression technologies (the presumed audience) to decide which system(s) to try.

An additional problem facing authors of this kind of methods book is deciding at what level to pitch the information. Given the broad range of techniques presented here, there are distinct limits on the depth of explanation that can be given. In fact, there are frequent references to other detailed summaries of the techniques under consideration, including books devoted to individual topics. Realistically, a laboratory interested in, for example, learning to use a baculovirus vector to produce a membrane protein in insect cells (and this is one of the more detailed chapters) is unlikely to use this book as a sole reference source. Those looking to learn to produce proteins in mammalian tissue culture cells by direct DNA transfection will be required to look elsewhere; that chapter is primarily a review of basic techniques for the manipulation of recombinant DNA molecules.

Overproducing membrane proteins, particularly on the scale necessary for structural analysis, can be a tricky business, so there is certainly a need for detailed procedural information on current expression systems. Whether this book fills that need is not clear: novices may find they need additional help, while those approaching their problem at a more advanced level may wish for more detailed analysis.

# Stretched to the limit

## Biomechanics and Cells

*edited by F. Lyall and A. J. El Haj, Cambridge University Press, 1994. £45.00/$74.95 (275 pages) ISBN 0 521 45454 9*

Most of the cells in our body reside within tissues that are subjected to frequent mechanical activity. The challenges of such an environment often require more of resident cells than mere tolerance: active cellular responses resulting in 'adaptation' or remodelling of a tissue are often evoked and the result is tissue accommodation to a changed or changing mechanical environment. For example, skeletal and cardiac muscle cells grow in size after certain forms of exercise, and epidermal cells of skin increase in number more rapidly at sites of massage or abrasion than they do elsewhere in this tissue. These, and a multitude of other known cellular responses to mechanical force, raise the following fundamental questions. What is the nature of the sensor used by a cell to detect the presence of a particular mechanical stress? And, once sensed, what are the second messengers that communicate the presence of the mechanical challenge to the cellular machinery that carries out the appropriate response? Although we understand the nature of tissue- or organ-level adaptations that are elicited by a mechanical stress in some cases, we are still in the dark as to which cell types constitute the responsive tissue elements and/or the exact nature of the cellular and molecular responses elicited.