
CONTENTS

Contributors

xi

Preface

xv

PART 1

Overview

1. Introduction to Transgenic Animal Technology

Carl A. Pinkert

I. Introduction

3

II. Historical Background

4

III. Applications and Overview of Text

7

References

11

PART 2

Transgenic Animal Production Focusing on the Mouse Model

2. DNA Microinjection and Transgenic Animal Production

H. G. Polites and Carl A. Pinkert

I. Introduction

15

II. General Methods

16

III. Summary

62

Acknowledgments

62

References

63

Appendix

65

3. Factors Affecting Transgenic Animal Production

Paul A. Overbeek

I. Introduction

72

II. Getting Started

72

III. Troubleshooting

92

IV. Transgenic Phenomenology	98
V. Summary	100
Acknowledgments	100
References	100
 4. Gene Targeting in Embryonic Stem Cells:	
I. History and Methodology	
Thomas Doetschman	
I. Stem Cells of the Embryo	113
II. Gene Targeting in Embryonic Stem Cells	121
III. Methods	127
Acknowledgments	136
References	136
 5. Gene Targeting in Embryonic Stem Cells:	
II. Conditional Technologies	
Edmund B. Rucker III, James G. Thomson, and Jorge A. Piedrahita	
I. Introduction	144
II. Conditional Modeling: A Brief History	145
III. Cre-loxP System Review, Development and Testing	146
IV. Cre-loxP and Transgenic Models	148
V. Methods	160
VI. Summary	164
Acknowledgments	166
References	166
 6. Retrovirus-Mediated Gene Transfer	
Teoan Kim	
I. Introduction and Discussion	173
II. Methods	185
Acknowledgment	190
References	190
 7. Nuclear Transfer Technologies	
Yukio Tsunoda and Yoko Kato	
I. Introduction and Discussion	195
II. Materials and Equipment	208
III. Preparation of Microtools	214

IV. Nuclear Transfer of Preimplantation Embryos	206
V. Nuclear Transfer of Embryonic Stem Cells and Somatic Cells	221
Acknowledgment	229
References	229

PART 3 Production of Transgenic Laboratory and Domestic Animal Species

8. Production of Transgenic Rats

Philip Iannaccone and Vasilii Galat

I. Introduction	235
II. Importance of Rats	236
III. Contributions from Transgenic Rats	237
IV. Production	239
V. Conclusions	247
References	247

9. Production of Transgenic Rabbits

James M. Robl and Amy S. Burnside

I. Applications of Transgenic Rabbits	251
II. Manipulation of Rabbit Embryos for Production of Transgenics	253
III. Materials and Methods	253
References	259

10. Production of Transgenic Fish

Richard N. Winn

I. Introduction	261
II. Discussion	262
III. Methods of Gene Transfer	263
IV. Establishing and Maintaining Transgenic Lineages	272
V. Care and Containment of Transgenic Fish	275
VI. Future of the Transgenic Fish	276
Acknowledgments	276
References	276

11. Production of Transgenic Poultry

J. N. Petite and P. E. Mozdziak

I. Introduction and Discussion	279
II. Methods	288

III. Summary	305
References	305
12. Production of Transgenic Swine by DNA Microinjection	
<i>M. J. Martin and Carl A. Pinkert</i>	
I. Introduction and Discussion	308
II. Methods	313
III. Alternative Methods for the Production of Transgenic Swine	323
IV. Summary	328
References	328
13. Production of Transgenic Ruminants by DNA Microinjection	
<i>H. Niemann, H. H. Döpke, and K. G. Hädeler</i>	
I. Introduction	337
II. Production of Zygotes Suitable for Microinjection	338
III. Microinjection of Ruminant Zygotes	344
IV. Transfer of Microinjected Embryos	349
V. Areas of Application and Perspectives	354
Acknowledgments	355
References	355
14. Production of Transgenic Nonhuman Primates	
<i>A. W. S. Chan, K. Y. Chong, and G. Schatten</i>	
I. Introduction	359
II. Methods	368
III. Summary	381
Acknowledgments	381
References	382
15. Nuclear Transfer Technology in Cattle, Sheep, and Swine	
<i>Lesley Paterson, William Ritchie, and Ian Wilmut</i>	
I. Introduction	395
II. General Methods	396
III. Summary	414
Acknowledgments	414
References	414

PART 4 Molecular Biology, Analyses, and Enabling Technologies**16. Vector Design for Transgene Expression***L. M. Houdebine, J. Attal, and J. L. Vilotte*

I. Introduction	420
II. Transcribed Region	421
III. Promoter Region	432
IV. Boundary Regions	433
V. Conclusions and Perspective	446
Acknowledgment	448
References	448

17. Analysis of Transgene Integration*Brad T. Tinkle and Gilbert Jay*

I. Introduction	459
II. Detection of the Transgene	459
III. Parameters for Evaluating a Transgene	461
IV. Analysis of the Transgene	462
V. Establishing a Transgenic Line	467
VI. Derivation of Homozygous Mice	469
VII. Summary	470
References	471

18. PCR Optimization for Detection of Transgene Integration*M. H. Irwin, W. K. Pogożelski, and Carl A. Pinkert*

I. Introduction	475
II. Discussion	476
III. Summary	483
References	483

19. Analysis of Transgene Expression*Lien Ngo and Gilbert Jay*

I. Introduction	486
II. Analyses of Steady-State Levels of Transgenic RNA Transcripts	488
III. Analyses of Steady-State Levels of Transgenic Protein Products	499
IV. Conclusions	510
References	510

20. Assisted Reproductive Technologies and Embryo Culture Methods for Farm Animals

Robert A. Godke, Marina Sansinena, and Curtis R. Youngs

- I. Introduction
- II. Assisted Reproductive Technologies
- III. Development of New Assisted Reproductive Technologies
- IV. Summary
- References

21. Databases, Internet Resources, and Genetic Nomenclature

Anna V. Anagnostopoulos, Larry E. Mobraaten, and Muriel T. Davisson

- I. Introduction
- II. Transgenic and Targeted Mutation Databases and Electronic Resources
- III. Standardized Nomenclature for Transgenic and Targeted Mutation Animals
 - References
 - Appendix I: Additional Mouse Databases and Internet Resources
 - Appendix II: Rat Databases and Internet Resources
 - Appendix III: Swine Databases and Internet Resources
 - Appendix IV: Sheep Databases and Internet Resources
 - Appendix V: Cattle Databases and Internet Resources
 - Appendix VI: Poultry Databases and Internet Resources
 - Appendix VII: Fish Databases and Internet Resources

Index

601