Contents

Section I: Physiology

1. The Testis: Development and Structure **3**
Deborah M Spaine, Sandro C Esteves
- Testis Development 3
- Testis Structure 4

2. The Testis: Function and Hormonal Control **8**
Jorge Haddad Filho, Deborah M Spaine, Sandro C Esteves
- General Structure of the Testis 8
- Endocrine Regulation 11

3. Sperm Transport and Maturation **14**
Deborah M Spaine, Sandro C Esteves
- Epididymis 14
- Sperm Transport 17
- Sperm Maturation 17

4. Seminal Plasma: Constitution, Chemistry and Cellular Content **19**
Stefan du Plessis
- Fluid Constitution 19
- Cellular Content 21

5. Environment and Male Fertility **23**
David Rizk, Stefan du Plessis, Ashok Agarwal
- Maternal and Infant Exposure 23
- Adult Exposure 24
- Lifestyle Exposure 26
- Smoking 26
- Alcohol and Drugs 26
- Diet and Obesity 26
- Scrotal Heat Stress 27
- Psychological Stress 28
- Cell Phone Radiation 28

Section II: Diagnostic Evaluation

6. Male Infertility: When and How to Start the Evaluation? **33**
Sandro C Esteves, Ricardo Miyaoka
- Epidemiology 33
- Physiopathology 33

- Etiology 34
- Clinical Presentation 34
- Differential Diagnosis 34
- Clinical Assessment 35
- Final Considerations 43

7. Initial Assessment of the Male **46**
Trustin Domes, Keith Jarvi

- Causes of Male Infertility 46
- Indications for Male Infertility Evaluation 47
- Basic Male Infertility Evaluation 48

8. Testing Beyond the Semen Analysis: The Evolving Role of New Tests **56**
Mary K Samplaski, Rakesh Sharma, Ashok Agarwal, Edmund Sabanegh Jr

- Semen Analysis 56
- Hemizona Assay 58

9. Human Sperm Bioassay **63**
Amjad Hossain, Shaikat Hossain, John Phelps

- Sperm Function Tests 63
- Sperm Bioassay 66
- Methodologies 67
- Impact of Art on Sperm Function Test and Sperm Bioassay 67

10. Diagnosing the Cause of Male Infertility—Is it Necessary? **70**
Wayne Kuang

- Maximizes Reproductive Potential 70
- Adverse Effects on Reproductive Potential 71
- Threats to Overall Health 72
- Genetic Causes 73
- Minimizes Psychosocial Stress 73

11. Role of Imaging in the Diagnosis and Treatment in Male Infertility **77**
Nabil Aziz, Edmund Sabanegh Jr

- Testicular Ultrasound Scanning 77
- Transrectal Ultrasonography 83
- Vasography 84
- Venography 85

12. The Assessment of Azoospermia **87**
Jason Hedges, Brian Le, Robert E Brannigan

- The Preliminary Diagnosis of Azoospermia 87
- Azoospermia Paradigms 87
- Evaluation of the Azoospermic Male 87
- Obstructive Azoospermia 88
- Nonobstructive Azoospermia 90

13. New Insights into the Genetics of Male Infertility **94**
Alan Fryer

- Known Genetic Causes of Male Infertility 94
- Dissecting the Genetic Causes of Idiopathic Male Infertility 100
- Treatment of Male Factor Infertility 102

14. Preimplantation Genetic Screening: Unraveling the Controversy **104**
Antonio Capalbo, Laura Rienzi, Zsolt Peter Nagy

- Definition and Background 104
- Indications 105

Section III: Medical Management

15. Endocrinology of Male Infertility and Hormonal Intervention **125**
Fnu Deepinder, Philip Kumanov

- Evaluation of Infertile Man from an Endocrinologist's Prospective 127
- Hormonal Intervention in Male Infertility 128

16. Infections in Male Infertility **133**
Ralf Henkel

- Leukocyte Problem 133
- Impact of Infections on Male Fertility and Sperm Fertilizing Capacity 133
- Infections of the Male Urogenital Tract 134
- Male Genital Tract Infections 135
- Male Accessory Gland Infection 136

17. Psychological Aspects of Male Infertility **141**
Tolou Adetipe, Nabil Aziz

- Inducers of Psychological Stress 141
- Milestones and Pivotal Periods 142
- Psychological Support 143
- Service Provision 144

Section IV: Surgical Management

18. Surgical Management of Genital Tract Obstruction **149**
Edmund Y Ko, Edmund Sabanegh Jr

- Anatomy and Physiology of the Genital Tract 149
- Pathology of the Genital Tract 150
- Preoperative Evaluation 150
- Surgical Planning 151
- Reconstruction Methods 151
- Vasovasostomy 152
- Vasoepididymostomy 156

- Surgical Management of Ejaculatory Duct Obstruction 158
- Surgical Complications 158

19. Varicocele Surgery in Modern Practice **162**
Fábio Firmbach Pasqualotto, Giovana Cobalchini, Eleonora Bedin Pasqualotto

- Incidence 162
- Varicocele: Reason for Infertility 163
- Surgical vs Embolization Approach 164
- Azoospermia and Varicocele 165
- Improvement in Semen Parameters after Varicocelectomy: Is there an Improvement with Assisted Fertilization? 165
- Varicocele in the Adolescent 166
- Benefit of Surgery for Couples with a Clear Indication of Assisted Fertilization 167

20. Sperm Surgical Retrieval Techniques: Critical Review **170**
Karen C Baker, Edmund Sabanegh Jr

- Outcomes 173

Section V: Intrauterine Insemination

21. Intrauterine Insemination in the Era of Assisted Reproduction **179**
Hassan N Sallam, Botros RMB Rizk

- Indications 179
- Stimulation Protocols 180
- Semen Processing 182
- Timing of Insemination 183
- Technique 184
- Results 184

22. Ovarian Stimulation for Intrauterine Insemination **185**
Sudha Ranganathan, Botros RMB Rizk

- Natural versus Stimulated Cycles 185
- Ovarian Stimulation Protocols 185

23. The Impact of Male Infertility on the Outcome of Intrauterine Insemination **194**
Marwa Badr, Botros RMB Rizk

- Predictive Value of Sperm Morphology in Intrauterine Insemination 194
- Predictive Value of Total Sperm Motility 195
- Predictive Value of the Sperm Count 198

Section VI: Assisted Reproduction

24. Assisted Reproduction and Gamete Manipulation Techniques for Male Infertility **203**
Hassan N Sallam, Botros RMB Rizk, Sherman J Silber

- Assisted Reproduction in Male Infertility 205
- Indications of Intracytoplasmic Sperm Injection 210
- Prerequisites of Micromanipulation 211

- Technique of Intracytoplasmic Sperm Injection 211
- Assisted Hatching 212

25. Assisted Reproduction and Sperm Retrieval Techniques for Male Infertility 214
Hanhan Li, Nina Desai, Kashif Siddiqi, Edmund Sabanegh Jr

- Assisted Reproductive Techniques 214
- Optimal Sperm Retrieval Techniques 215
- Cryopreservation of Sperm 217
- Intracytoplasmic Sperm Injection Outcomes 218
- Perinatal Complications 218
- Congenital and Developmental Abnormalities in Children Born from ICSI 218

26. Fertility Management in Spinal Cord Injury and Ejaculatory Dysfunction 222
Viacheslav Iremashvili, Nancy L Brackett, Dana A Ohl, Jens Sønksen, Charles M Lynne

27. Challenges Facing the Embryologist at the Bench 229
Karen Schnauffer, Stephen Troup

- Training 229
- Regulation 230
- Witnessing 230
- Traceability 231
- Practical Difficulties 231

28. Sperm Banking via Cryopreservation 234
Sajal Gupta, Ashok Agarwal, Reecha Sharma, Ali Ahmady

- Indications for Sperm Banking 234
- Surgical Sperm Retrieval 235
- Barriers to Sperm Banking 237
- Screening of Patients Prior to Banking 237
- Preparation and Selection Mechanisms Prior to Banking 237
- Utilization of Banked Samples 240
- Ethical Issues 240

29. Sperm Preparation and Selection Techniques 244
Tahir Beydola, Rakesh K Sharma, Ashok Agarwal

- Simple Wash Method 244
- Migration-based Techniques 244
- Magnetic Activated Cell Sorting 247
- Glass Wool Filtration 248
- Reduction of Semen Viscosity 249
- When to use a Particular Sperm Preparation Technique 249
- Sperm Selection Based on Membrane Charge 249
- Sperm Preparation for ART 250

30. Understanding Sperm Apoptosis and Improving Sperm Selection 252
Uwe Paash, Sonja Grunewald

- Induction and Inhibition of Sperm Apoptosis Signaling 254
- Selection of Non-apoptotic Spermatozoa 255

31. Antisperm Antibodies Detection and Management **259**
Tamer M Said, Iryna Kuznyetsova

- Detection of Antisperm Antibodies 259
- Options for Antisperm Antibodies Testing 260
- Clinical Significance of Antisperm Antibodies 261
- Treatment Strategies for Males with Antisperm Antibodies 261

32. Management of Nonobstructive Azoospermia **265**
Ibrahim Fahmy, Ahmed El-Guindi

- Etiology 265
- Diagnosis of Nonobstructive Azoospermia 266
- Treatment of Nonobstructive Azoospermia 269

33. Klinefelter Syndrome **276**
Ibrahim Fahmy

- Genetics 276
- Etiology 277
- Clinical Picture 277
- Management 279

34. Y-Chromosome Genetics and Fertility **284**
Nissankararao Mary Praveena, Rachel A Jesudasan

- Genes on the Y-Chromosome 284
- Chromosomal Rearrangements Involving the Y-Chromosome 288

35. The Biological Clock of Male Fertility **295**
Fábio Firmbach Pasqualotto, Eleonora Bedin Pasqualotto

- Semen Analysis 296
- Sperm DNA Damage 297
- Alcohol 297
- Cigarette Smoking 297
- Illicit Drugs 298
- Antihypertensives 298
- Calcium Channel Blockers 298
- α-Adrenergic Blockers 298
- Angiotensin Converting Enzyme Inhibitors 299
- Psychotherapeutic Agents 299
- Antipsychotics 299
- Tricyclic Antidepressants 299
- Other Psychotherapeutic Agents 299
- Other Hormonal Therapies 299
- Fertility of Aging Men 299
- Numerical Chromosome Disorders 300

36. Ethical Dilemma in Infertility **305**
Pasquale Patrizio, Marcia C Inhorn

- Use of Donor Sperm to Procreate 305
- Fertility Preservation 309
- Posthumous Use of Stored Reproductive Tissue and Gametes 310

37. Ethics and Human-assisted Reproductive Technology **313**
Martin Olsen

- Ethical Decision-Making 313
- Specific Ethical Issues 314

38. Repopulating the Testes: Are Stem Cells a Reality? **320**
Trustin Domes, Kirk C Lo

- Stem Cell Primer 320
- Human Spermatogenesis Primer 320
- *In Vitro* Spermatogenesis Models 321
- *In Vivo* Spermatogenesis Models 322
- Testis Xenograft Transplantation Model 323

Index *327*