Paternal Influences on Human Reproductive Success
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This book is dedicated to my family, who is always supportive of my small efforts to expand our understanding of infertility and assisted reproduction and improve our therapies for infertile couples.
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Preface

One theme that draws abundant attention from the world’s press is the theory of the imminent demise of human males. Whether it be due to reports of a "degenerating Y chromosome," advances in cloning technologies, the theory of an "ultimate revenge of women," or some combination of the three scenarios, the public seems to relish a sensational account of the impending extinction or irrelevance of the male. This book is not such an account. Indeed, the objective of this book is to summarize and explore the recently growing emphasis on the paternal role in reproductive fitness.

It is interesting that a book emphasizing the role of the male gamete in reproduction is necessary. While the necessity of sperm for normal reproduction has been known since the studies of Spallanzani, the role that the sperm play in forming a normal embryo has not been clear, and in fact is evolving rapidly. Our understanding of the male contribution evolved from the "spermist theory" promoted by Hartsoeker in the late seventeenth century that postulated a fully formed "homunculus" within a sperm cell, then shifted with the "epigenesis" theory, supported by Harvey and others, which held that both the oocyte and sperm were necessary for embryogenesis. Epigenesis was firmly established with the identification of chromosomes as the heritable component, however, the contribution of the sperm has largely been considered to only consist of a haploid set of chromosomes, while the oocyte has been looked upon as the controlling force for embryogenesis and the provider of the necessary factors for early embryogenesis. Ironically, the recent explosion of research into "epigenetics," a term related to the early developmental theory of epigenesis, has changed the paradigm of the possible importance of the male contribution to embryogenesis and reproductive fitness.

This book explores the current understanding of the role of sperm in reproductive success. Areas of interest include genetic factors, including DNA integrity, aneuploidy, structural variations, and mutations within the germline, as well as epigenetic factors and mechanisms, including epigenetic influences in normal embryogenesis, the role of sperm epigenetic abnormalities in infertility, and the effects of environmental factors on the epigenome. Since it is becoming increasingly common for men to father children later in life, the role of aging is carefully considered in several chapters, not only from a clinical perspective, but also with an eye towards the basic science of changes in spermatogenesis in the older male. Lastly, since fertilization and early embryogenesis are increasingly performed in the laboratory through assisted reproduction techniques, emerging laboratory concepts are also discussed.

I thank all who have assisted in the preparation of this book, particularly the chapter authors. This distinguished group of scientists and clinicians are the cutting edge of the field of male factors involved in reproductive success. I also thank my assistant, Lori Barnard, for her consistent energy and expertise in helping to move this book forward. Lastly, I thank my colleagues, especially those from my own clinic and laboratories, for their stimulating work and discussions that have helped to move the field forward, aid patients in need, and assist me in endeavors such as this book.