Male Reproduction Content and Volume Overview

Michael K Skinner, Center for Reproductive Biology, School of Biological Sciences, Washington State University, Pullman, WA, United States
Katherine Loveland, Centre for Reproductive Health, School of Clinical Health, Monash University, Clayton, VIC, Australia

This is an update of Bernard Jégou, Michael K. Skinner, Content and Volume Overview, Editor(s): Michael K. Skinner, Encyclopedia of Reproduction (Second Edition), Academic Press, 2018, Pages 1–2, ISBN 9780128151457, https://doi.org/10.1016/B978-0-12-811899-3.64553-6.

Abstract

The Male Reproduction Volume 1 of the Encyclopedia of Reproduction second third has a number of sections to separate the various chapters and focus on the various topics involved. Although a number of reviews of the topic have been published for the experts and research scientists in the area (Hafez and Hafez, 2016; Russell *et al.*, 1990; Skinner and Griswold, 2005; Skinner and Jegou, 2018), the current Encyclopedia and Volumes are summaries of the key topics for students and non-experts as an educational resource in the biology of reproduction. A brief summary of each section and the chapters involved are provided. The objective is to provide an overview and clarify the relationships of the different topics.

Key Points

- Overview Volume 1.
- Summary Integration of Chapters.

Overview

The Volume 1 is focused on male reproduction in mammals and has the correlated male reproduction in non-mammal species outlined in Volume 6 on Comparative Reproduction. The first section involves Testis Biology as the testis is the location of spermatogenesis and source for the germline or spermatozoa that allow propagation of the species. An overview and history of testis biology is presented followed by overviews of the structure and cell types in the testis. The detailed endocrinology associated with testis function and development is presented. The following section is on Testis Cell Biology that provides the cell and molecular biology aspects of the Sertoli cell that physically support the developing spermatogenic cells, Leydig cells that provide the source for androgens/testosterone in the male for testis function and a large number of other tissues in the male. The seminiferous tubules are surrounded by peritubular cells and testicular macrophages in the interstitial space between the tubules along with vascular cells is also reviewed. The spermatogenic cells in regards to structure, cell biology and various cell-cell interactions are reviewed. The developmental aspects of the testis are reviewed in the male gonadogenesis and male sex determination chapters. The critical phenotypic and molecular aspects of the male sex determination are reviewed. The subsequent pubertal developmental period is then presented. The adult testis physiology topics focus on spermatogenesis, the associated syncytium, seminiferous cycle, spermiation, and the blood testis barrier are reviewed. Methodologic reviews of testis cell and organ cultures, and germ cell transplantation are presented. Finally, the physiological impacts of castration are reviewed.

The next major section deals with Male Endocrinology. The hypothalamus, pituitary and testis axis is reviewed with subsequent chapters on the cell and molecular aspects of pituitary cells. Specific chapters on hormones including Follicle Stimulating Hormone (FSH), Luteinizing Hormone (LH), Inhibin, Activin and Androgen are presented. The genomic and non-genomic actions of androgens are reviewed, as well as dihydroxytestostrone (DHT). The associated androgen actions on somatic cells, brain programming and aggressive behavior are then reviewed.

The Male Reproductive Tract section has a series of chapters for each organ and developmental process. The male reproductive tract fetal development is reviewed with a focus on Wolffian duct development. In the adult, the spermatozoa produced in the testis first enter the Rete Testis and travel through the Efferent Ducts to enter the Epididymis. The structure, function and endocrinology of these organs are reviewed. Epididymal sperm maturation is then reviewed considering the ability of sperm to develop the capacity for motility and the associated structural and molecular aspects of epididymis function. The epididymal sperm then move to the Vas Deferens for storage prior to ejaculation. The prostate is a glandular organ that produces components

of the semen and the structure, molecular and endocrine aspects of prostate biology are reviewed. The Seminal Vesicle is the next male reproductive tract organ that also contributes components to semen and the structure, secretion and endocrinology of this organ are reviewed. The final male reproductive tract organ reviewed is the penis and the structure, erection, endocrinology and abnormalities are reviewed. The ejaculation and semen constituents are reviewed in the final chapter of this section.

The Male Reproductive Physiology section presents a number of key topics associated with male reproduction. This includes male pubertal development in regards to reproductive organ development and endocrinology. Male fertility in regards to sperm numbers, motility and male reproduction senescence are reviewed. The roles of circannual and circadian rhythms are presented. The energetics, immunology and nutritional factors in mammalian reproduction are reviewed. The regulatory roles of the pineal gland, vomeronasal organ in male reproduction are reviewed. Finally, the current knowledge of male contraception is presented.

The Comparative Mammalian Male Reproduction section is focused on a variety of different species. The non-mammalian species are presented in Volume 6 to provide a more complete comprehensive reproduction presentation. The Volume 1 contains the major mammalian male reproduction chapters. An overview is presented and then separate chapters on the cow, pig, horse, sheep, rodent, dog, cat, primate and human. The unique and conserved aspects of mammalian reproduction are reviewed. Finally, the assisted reproduction technology (ART) and contraceptive aspects in mammalian species are presented. A more human focus on ART and contraception are presented in Volumes 4 and 5.

The final section of Volume 1 involves Environmental Toxicology of Mammalian Male Reproduction. The impacts and actions of testis toxicants are reviewed. Environmental factors such as temperature, metals and steroids are discussed. The various endocrine steroids and associated antiandrogens or antiestrogens are discussed. This includes endocrine disruptor toxicants like the plastics derived bisphenol A (BPA) and phthalates, as well as pesticides. The influence of these factors on paternal exposures, preconception exposures on offspring are reviewed. The epigenetic transgenerational inheritance impacts of environmental factors on male reproduction is presented. Overall, how these environmental factors impact the male reproduction is discussed and reviewed.

The breadth, quality and educational impact of this Volume 1 of the Encyclopedia of Reproduction is solely due to the chapters authors who are internationally recognized authorities on the topics and contributed significantly to the scientific advances in the field. All are active researchers that have made major contributions in the area of Male Reproduction. The contributors to this volume are very much appreciated.

Summary

Overview of the Volume 1 Male Reproduction topics involves the sections of testis, development, endocrinology, male reproductive tract, male reproductive physiology, comparative mammalian male reproduction, and environmental toxicology.

References

Hafez, B., Hafez, E.S.E., 2016. Reproduction in Farm Animals. John Wiley & Sons Published Online: 22 JAN 2016.
Russell, L.D., Ettlin, R.A., Hikim, A.P., Clegg, E.D., 1990. Histological and Histopathological Evaluation of the Testis. Cache River Press.
Skinner, M.K., Griswold, M.D., 2005. Sertoli Cell Biology. Elsevier -Academic Press, San Diego, CA.
Skinner, M.K., Jegou, B., 2018. Historic considerations in male reproduction. In: second ed. In: Skinner, M.K. (Ed.), Encyclopedia of Reproduction Vol 1. Elsevier, pp. 3–9.