ACT Study Guide

The ACT is a clinical specialty and thus a candidate should expect to be able to communicate effectively to veterinarians and owners regarding all aspects of theriogenology. The candidate will also be expected to perform routine and advanced clinical skills and understand the anatomy, physiology and pathophysiology of all aspects of theriogenology. In order to understand and be proficient in theriogenology, a strong didactic understanding of embryology, genetics, reproductive physiology and anatomy is required and expected.

This is a suggested guide to be used as a skeleton on which to build each individual candidate’s study plan. Each candidate will have different backgrounds and strengths, so each training program should meet these varied requirements. As such, this template should be utilized by each candidate in whatever manner is most helpful for that candidate’s training, knowledge, skills and clinical abilities.

A word of caution is provided to indicate that simply following this guide will not guarantee passage of the certifying exam, but rather its intent is to help direct new candidates to set up a logical plan of study to ensure all relevant areas of expected expertise have been included in their study plan. It also provides a list of textbooks and resources considered useful in this course of study.

Setting up a timeline for study is encouraged by all candidates in consultation with their mentors. Preparation for the exam requires a phenomenal amount of time and effort in addition to the candidate’s daily job demands. Starting to prepare at the onset of the candidate’s program of study, taking notes and reviewing them regularly so that the scientific knowledge base is maintained at the time the candidate is ready to sit the examination. A daily/weekly study plan should be formulated and updated regularly with input from the candidate’s mentors, taking into consideration the candidate’s understanding of the most recent studied material and adding or removing future materials based on the candidate’s strengths and weaknesses.

Joining or creating a journal club to learn how to critically review manuscripts is integral to becoming an accredited specialist. Understanding which studies have valid conclusions and should be added to the candidate’s knowledge base and which are of questionable importance helps separate a specialist from a general practitioner or researcher.

Choosing a study group is also critical to the success of a candidate. A well-run study group will be led by one or more DACT, not other candidates. These DACT’s should take an active role in ensuring that the topics discussed are accurate and up to date in terms of the most recent research and data, and also to help lead the discussion to make sure it remains pertinent.

Practicing writing responses to multiple choice and essay questions is also recommended. These should be taken without study aides, using the candidate’s recall and should be reviewed by the candidates’
mentors. Timed test taking is also recommended to acclimate the candidate to what will be expected during the exam itself.

At the end of the study guide is a list of references. The references are grouped in tiers, and are listed in alphabetical order, not in order of importance or how they should be read. Those listed in tier 1 contain basic knowledge that all candidates MUST master. Mastering the information in books from tier 1 is a recommended starting point. This information should then be updated and complemented with the books and journals listed in tiers 2 and 3. Please, pay special attention to the Proceedings of the Annual Meeting of the Society for Theriogenology published in Clinical Theriogenology. The books and journals listed in tier 3 provide the most in-depth and detailed information and will help you gain greater depth of knowledge once you have mastered the basic information. Each candidate will need to choose which of the books, journals, websites and proceedings from Tier 3 are important for their training program. Finally, the list of additional reading can help candidates that need reinforcement in areas of weakness.

Study guide:

I) Embryology
   a. Organizational anatomy of vertebrates
   b. Gametogenesis, gastrulation and neurulation
   c. Embryonic duplication and twinning
   d. Extraembryonic membranes and placentation
   e. Mechanisms of development
      i. Congenital malformations and teratogens
   f. Development of organ systems
      i. Nervous system
      ii. Muscle and connective tissue
      iii. Limbs
      iv. Cardiovascular
      v. Pharynx and pharyngeal pouches
      vi. Respiratory system
      vii. Digestive system
      viii. Urinary system and adrenal glands
      ix. Reproductive organs
   g. Cytogenetics and sex determination
   h. Disorders of sexual development

II) Anatomy
   a. Pelvic bones and ligaments
   b. Hypothalamus and pituitary – both sexes
   c. Female reproductive tract
      i. Clitoris, vulva, vestibule, vagina, cervix, uterus, uterine tubes (in mammals, oviducts in oviparous species), ovary and associated supporting (broad) ligaments.
   d. Male reproductive tract
i. Prepuce, penis, urethra, accessory sex glands, ampulla, ductus deferens, spermatic cord, epididymis and testes.

III) Reproductive Physiology
a. Reproductive hormones
   i. HPG axis and appropriate feedback mechanisms.
   ii. Male
   iii. Female
b. Puberty
c. Estrous cycle
d. Coitus
e. Oogenesis
f. Spermatogenesis
g. Ovulation
h. Fertilization
i. Pregnancy
   i. Period of the embryo
      1. Recognition of pregnancy
      ii. Placentation
      iii. Period of the fetus
      iv. Methods of pregnancy diagnosis
      v. High risk pregnancy management
j. Parturition
   i. Parturition process – stages and uterine involution
      1. Maternal cascade of events
      2. Fetal cascade of events
   ii. Passage of fetal membranes
   iii. Induction of parturition
   iv. Postpartum period
k. Lactation

IV) Dystocia
a. All species
b. Terminology
c. Management
   i. Forced extraction, mutation, assisted delivery, fetotomy, cesarean-section
d. Abnormalities of the fetus
e. Uterine torsion and other displacements
f. Obstruction
g. Inertia

V) Disorders of the peripartum period
a. Periparturient hemorrhage
b. Lacerations
c. Uterine, vaginal, perineal rupture
d. Prolapse of uterus, vagina, bladder
e. Metabolic diseases
f. Retained fetal membranes

g. Metritis

h. Postpartum paresis

VI) Infertility

a. Female

i. Infectious disease

ii. Non-infectious disease

iii. Endocrine disorders

iv. Breeding injury

v. Nutritional

1. Hormones that impact on the hypothalamus

2. Impact of nutritional hormones on the hypothalamic KNDY cells impacting on the GnRH centers that control reproduction

vi. Degenerative

vii. Toxins, including endocrine disruptors

viii. Neoplasia

ix. Auto-immune

x. Diagnostic testing and breeding soundness examination

xi. Therapeutics

1. Medical

2. Surgical

b. Male

i. Infectious disease

ii. Non-infectious disease

iii. Endocrine disorders

iv. Breeding injury

v. Nutritional

vi. Degenerative

vii. Toxins, including endocrine disruptors

viii. Neoplasia

ix. Auto-immune

x. Diagnostic testing and breeding soundness examination

1. Semen collection and evaluation

2. Advanced semen diagnostics

xi. Therapeutics

1. Medical

2. Surgical

VII) Abortion

a. All species

b. Infectious

i. Bacterial

ii. Viral
iii. Fungal
iv. Protozoal
c. Non-infectious
d. Endocrine
e. Trauma
f. Torsion
g. Hydropsical conditions
h. Accidents of pregnancy
i. Extrauterine pregnancy
j. Abdominal hernias

VIII) Disorders of mammary gland
a. Agalactia, hypogalactia
b. Galactorrhea
c. Galactostasis
d. Mastitis
e. Disorders of mammary development
f. Inappropriate lactation syndrome
g. Neoplasia

IX) Artificial insemination
a. Techniques
b. Synchronization protocols
c. Semen handling and principles associated with storage
   i. Fresh; fresh-chilled; frozen

X) Pharmacology
a. Gonadotrophins
b. Prostaglandins
c. Steroid hormones
d. Tocolytics
e. Ecbolics
f. Estrus suppression/prevention
g. Estrus induction
h. Fixed-timed artificial insemination
   i. Contraceptives

XI) Advanced reproductive techniques
a. Embryo transfer
b. ICSI
c. OPU/IVF/IVM
d. GIFT
e. Cloning
f. Genetic manipulation
   i. SNP

XII) Neonatology
a. All species
b. Normal parameters
i. Thermoregulation
ii. Cardiovascular, renal, hepatic function
iii. acid-base, hematology, chemistry
iv. Immunologic development
v. Adrenal function
c. Colostrum
d. Nutrition
e. Supplemental nutrition
f. Pharmacologic considerations
g. Physical examination
h. Diseases
   i. Infectious
      1. Bacterial
      2. Viral
      3. Fungal
      4. Protozoal
   ii. Hypoglycemia
   iii. GI diseases
   iv. Respiratory diseases
   v. Musculoskeletal diseases
   vi. Dermatologic diseases
   vii. Hematologic/Immunologic diseases
      1. Neonatal isoerythrolysis
   viii. Neurologic diseases
   ix. Renal/urinary tract diseases
   x. Nutritional
XIII) Ethics and welfare
   a. Contraception
   b. Health testing and genetic evaluation

Reference list:

Tier 1


Johnson AK, Kutzler M (2022) Feline Reproduction. CABI


Noah’s Arkive. An open repository of veterinary pathology slides contributed by individuals and institutions around the world. Noah’s Arkive is maintained by the Davis/Thompson Foundation. https://davisthompsonfoundation.org/noahs-arkive/


Zachary JF (2017) Pathologic basis of veterinary disease

**Tier 2**


Proceedings from Annual Conferences of the Society for Theriogenology, Clinical Theriogenology. Last 5 years.


Wolfgang and Dietrich (2004) Veterinary reproductive ultrasonography

**Tier 3**

**Special issues**


Veterinary Clinics of North America – Food Animal Practice: (1) Bovine theriogenology, vol 21, 2005; (2) 32 (2016) Bovine Theriogenology

Veterinary Clinics of North America – Equine Practice: (1) Advances in reproduction, vol 22, 2006; (2) 32 (2016) Advances in diagnostic and therapeutic techniques in equine reproduction

Veterinary Clinics of North America – Small Animal Practice: (1) Small animal theriogenology 2018; (2) Clinical theriogenology, vol 31, 2001

**Conference proceedings**

Proceedings from the International Symposium on Equine Reproduction

Proceedings from Annual Conferences of the International Embryo Transfer Society

Proceedings from Annual Conferences of the American Association of Bovine Practitioners.

Proceedings from Annual Conferences of the American Association of Swine Practitioners.

Proceedings from the International Congress on Animal Reproduction

Proceedings from Annual Conferences of the American Association of Equine Practitioners


**Journals**

Animal Reproduction Science

Biology of Reproduction

Clinical Theriogenology

Equine Veterinary Journal

JAVMA -Therio case of the month

Journal of andrology
Journal of Animal Science
Journal of Dairy Science
Journal of Equine Veterinary Science
Reproduction
Reproduction in Domestic Animals
Theriogenology
Veterinary Record

**Supplemental reading:**
Fossum (2018) Small animal surgery
Greer ML (2014) Canine reproduction and neonatology Handbook of Veterinary Obstetrics,
Peter GG Jackson. 2004 mentals. Equiservices Publishing,


Root Kustritz M (2005) The dog breeder's guide to successful breeding and health

Samper J (2009) Equine breeding management and artificial insemination management


Theriogenology web sites: (* indicates excellent resource especially for review for practical portion)

*https://www.vet.cornell.edu/canine-atlas - Cornell’s Canine Embryonic atlas

*https://eclinpath.com/ - Cornell’s Clinical pathology site

http://www.havemeyerfoundation.org/monograph.htm - access to the Havemeyer monographs – many are reproductive in nature (equine)

www.ivis.org Has a library with books that are useful for reproduction including toxic plants and various proceedings.

*https://lorimainsection.blogspot.com/ - Dr Rob Lofstedt’s reproductive imaging site

*https://davisthompsonfoundation.org/noahs-arkive/ - Noah’s Arkive. An open repository of veterinary pathology slides contributed by individuals and institutions around the world. Noah’s Arkive is maintained by the Davis/Thompson Foundation.

http://placentation.ucsd.edu/ - comparative placentation by Dr Benirschke – UC Davis

https://repropedia.org/ - a reproductive dictionary

*http://vetrepropath.com/ - Dr Rob Foster’s Reproductive Path site

*https://visgar.vetmed.ufl.edu/ - Dr Marteen Drost’s visual guide to reproduction