Reproductive Medicine in Freshwater Turtles and Land Tortoises

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KEYWORDS

• Chelonian • Dystocia • Infertility • Reproduction • Surgery • Tortoise • Turtle

KEY POINTS

- As pressure continues to mount for wild populations of chelonians, the need for developing long-term and sustainable breeding programs will increase.
- Veterinarians can play an important role in ensuring the success of these programs for both institutions and individuals.
- It is important for veterinarians to develop a solid foundation of knowledge regarding the reproductive anatomy, physiology, and behaviors of these animals to differentiate normal from abnormal.
- Fortunately, most of the reproductive diseases seen in these animals are similar to those in other classes of animals and case management follows similar protocols.

INTRODUCTION

With the increased popularity of chelonians as pets, there is a need to establish successful captive breeding programs to ensure animals are available in the commercial trade without further affecting wild populations of animals. Chelonians are one of the most highly impacted groups of animals in the world because of demands on them for the pet trade, as sources of food, and for cultural/medicinal purposes. As with many other species commonly found in the pet trade, captive breeding programs are needed to ensure that these animals can be successfully raised and the necessary numbers to satiate the public are provided. In the United States and Europe, breeding programs are ongoing and have been, for many species, quite successful. However, herpetoculturists still have difficulty consistently reproducing some species, and for those that are successful, may still have some issues arise (eg, dystocia) that require

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intervention by a veterinarian. Because of these potential concerns or complications, it is important that veterinarians become familiar with the reproductive biology and potential diseases associated with the reproductive tracts of these animals to better serve their clients and chelonian patients. The purpose of this article is to review the reproductive anatomy of chelonians, discuss the diagnostic management of these types of cases, and review potential treatments.

CHELONIAN REPRODUCTIVE ANATOMY AND PHYSIOLOGY

Male Anatomy

Chelonians have paired testicles. The testicles are elongated and originate cranial to and course ventrally to the kidney; they are adhered loosely to the kidneys by the mesorchium. The color of the testicles can vary greatly based on species and age. In some species, melanin may be seen on the surface of the testes, but in most they are pink, white, tan, or yellow.[1–4] Sperm originates in the testicles and are transported though the epididymis to the ductus deferens, where they are deposited into the urodeum of the cloaca through an orifice at the neck of the bladder. Urinary excreta are deposited into the urodeum and flows retrograde into the bladder or are excreted from the cloaca. Semen samples collected by one of the authors (M.A.M.) using electroejaculation are commonly contaminated with urine as a result of their anatomy.[5] Just ventral to the opening of the ductus deferens, ureter, and bladder neck is the bulbous urethralis and the beginning of the penile corpus cavernosa. Compared with squamates, chelonians possess a single phallus that does not invert like hemipenes. The chelonian phallus is a single grooved organ arising from the ventral surface of the cloaca. The midline groove lies between 2 seminal ridges that run longitudinally along the phallus to the distal tip; these ridges are formed from coelomic canals and corpus cavernosa or corpus spongiosa. Erection occurs when the corpus cavernosa becomes engorged with blood from the internal iliac vessels, curling the seminal ridges dorsally and medially where they meet to form a tube called the seminal groove. Sperm is transported from the ductus deferens into the seminal groove and then down the phallus. The phallus contains corpora fibrosa, which supports the phallus ventrally and then cranially at full erection. Ventral to the corpora fibrosa is the muscularis retractor of the phallus, which when contracted replaces the phallus into the cloaca after the corpus cavernosa relaxes. The distal phallus consists of a spade-shaped glans penis with 3 distinct folds: the plica externa, plica media, and plica interna. This allows the male to successfully deposit the seminal fluid into the coprodeum of the female.[1–4]

Male Physiology

Spermatogenesis is a complex process in chelonians that is similar to other amniotes. Chelonians are considered postnuptial regarding spermatogenesis, and therefore, the process does not coincide with mating. Sperm is typically produced after the mating season and stored for extended periods of time in the male urogenital system. Spermatogenesis immediately before the breeding season has only been documented in sea turtles. Testosterone concentrations increase during spermatogenesis, and in some species, elevated testosterone concentrations have also been documented during peak mating activity. Two forms of gonadotropin-releasing hormone (GnRH) are present in chelonians: cGnRH-I and cGnRH-II.[6] Mammalian GnRH has no effect on plasma luteinizing hormone (LH) or steroid concentrations in male turtles. These GnRH-like hormones act at the level of the pituitary to promote production of follicle-stimulating hormone (FSH) and LH-like gonadotropins. Compared with mammals,