Reptile Perinatology

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KEYWORDS

• Reptile • Perinatology • Amniotic egg • Hatchling

KEY POINTS

- In oviparous species, the amniotic egg includes the shell, albumen, yolk and yolk sac, and extraembryonic membranes; each structure serves physiologic function(s) to support the developing embryo.
- Artificial incubation of reptile eggs should mirror natural incubation conditions in terms of temperature and moisture and requires construction of an appropriate incubation chamber or use of a commercially available incubator.
- Egg viability can be determined through visual assessment, candling, or auscultation of the embryo heart rate.
- Manual pipping should be reserved for cases of viability of the embryo in question and requires sterile technique and magnification.
- Neonates/hatchlings are at risk for suffering from the same illnesses noted in adults, including husbandry-related and infectious processes; yolk-associated illness often requires veterinary surgical intervention.

INTRODUCTION

Reptile perinatology is the time period surrounding hatching in oviparous species and surrounding birth in viviparous species. For the purposes of this review, the term perinatology includes applicable information regarding the egg, incubation period, and hatching (relevant for oviparous species) as well as hatchling/neonatal care and medicine.

THE REPTILIAN (AMNIOTIC) EGG

The reptilian egg at oviposition is composed of the egg shell, albumen (or whites), and the yolk. Each structure is involved in some support mechanism for the developing embryo (**Table 1**). Unlike avian eggs, reptilian eggs do not have an air cell or chalazae.

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Table 1
Structures of the reptile egg at oviposition and their physiologic functions to support the developing embryo

Structure	Function (s)	Additional Notes
Shell	• Barrier between the external environment and the embryo • Porous nature allows for gas and water vapor exchange • Calcium source for the developing embryo	• Can be either soft/leathery or hard in nature • Hard-shelled eggs laid by species that naturally incubate in arid environments • Soft-shelled eggs laid by species that naturally incubate in moist environment
Albumen	• Physical support for the embryo1 • Water storage • Antimicrobial peptides protect the developing embryo	• Created by specialized glands in the material oviduct
Yolk and yolk sac	• Primary energy source for embryo and hatchling • Storage site for retinal, hormones, fatty acids, proteins, minerals •Maternal transfer of antibodies	• Can be a source of maternally derived toxins

As incubation progresses, there is development of the embryo and the extraembryonic membranes within the egg. The extraembryonic membranes are composed of the amnion, allantois, and chorion and each has a physiologic function:

- The amnion is the membrane that directly surrounds the embryo. Contraction of smooth muscles in the amnion during hatching causes retraction and is ultimately responsible for the internalization of the yolk.[1,2]
- The allantois originates at the umbilicus and is a continuation of the embryo urachus. The allantoic cavity is the major storage site for urea excretion.[3]
- The chorion is the outermost membrane that encloses the embryo, amnion, allantois, yolk, and yolk sacs.

The yolk and its yolk sac attach to the developing embryo at the umbilicus and continue as the vitelline duct (also referred to as the omphalomesenteric duct) that allows direct transfer of nutrients from the yolk to the developing embryo intestines. During incubation and embryonic development, as the yolk contents traverse the vitelline duct, the yolk size decreases while the embryo size increases.[3]

ARTIFICIAL INCUBATION

Collection of Eggs

During collection of eggs, care should be taken not to change the spatial orientation of the egg during transport or when placed into the substrate of the incubator. Turning seems to be fatal once performed after embryo attachment.[4,5] Because the exact times of embryo attachment postoviposition are not elucidated for all species, the author recommends taking care to not change the spatial orientation of the egg during transport.

Incubator

Incubators can either be constructed or purchased. There are several commercially available reptile and avian incubators. Constructed incubators should be designed with a double-chamber principle (**Fig. 1**). The eggs and substrate are within the inner chamber