

# Gestational Aging and Determination of Parturition Date in the Bitch and Queen Using Ultrasonography and Radiography

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## KEYWORDS

- Gestational aging • Canine • Feline • Fetal maturation • Pregnancy length
- Ultrasound

## KEY POINTS

- Radiography can be used to diagnose pregnancy and confirm fetal numbers but is less accurate in the determination of fetal age and readiness for birth than ultrasound.
- Ultrasound imaging can be used to determine gestational age via measurement of fetal and extrafetal structures in bitches and queens.
- There is no substitute for accurate ovulation timing at the onset of the estrous cycle to determine gestational age.

## INTRODUCTION

Pregnancy in the bitch and queen is a relatively short process, compared with other domestic species, lasting only 65 days from the luteinizing hormone (LH) surge. This short duration of pregnancy means that fetuses are born in an immature state and the final development of most organ systems occurs in the weeks to months after birth. Considerable development of major fetal organ systems occurs during the last days of gestation, in preparation for survival outside the uterus. Failure of the fetuses to complete the maturation process results in failure to survive. Additionally, owing to the nature of the zonary placenta, once a fetus exceeds its due date by more than 2 days, it will demand more nutritional support than the placenta is able to provide, resulting in intrauterine fetal death. Thus, it is critical to ensure that each fetus has attained, but not exceeded, its maximal gestational age before delivery.

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There are several situations when the determination of gestational age and fetal maturation are necessary. Most of these situations arise when there is either inadequate or no ovulation timing to allow determination of an accurate due date.

- Patients that will be allowed to deliver naturally but may require veterinary care during parturition. This measure allows the breeder and veterinarian to be prepared and available for the onset of labor.
- Patients that will undergo an elective cesarean delivery for a variety of reasons, such as high-risk breed (brachycephalic dog and cats); large or giant breeds bitches with singleton or small litters that may not initiate labor on their own; bitches with large litters where development of uterine inertia is a concern; and patients with a prior history of dystocia or primary uterine inertia.
- Patients with high-risk pregnancies including gestational diabetes mellitus or pregnancy toxemia. In these cases, the dam is often supported as far into the pregnancy as possible to try to get the fetuses to term. In some cases, it may not be possible to continue owing to the failing health status of the dam and in these cases the fetuses may not survive if they must be delivered preterm.
- Patients requiring tocolytic support during pregnancy. This may include dams that require progesterone supplementation owing to luteal failure as a result of chronic endometritis, stress, partial abortion, or idiopathic luteal insufficiency. It also includes dams that enter preterm labor owing to abnormalities or defects in the myometrium from nutritional, parasitic, environmental, traumatic, or inflammatory causes. Determination of the due date is imperative in these cases to either know when to withdraw the tocolytic agents or to know when to perform a cesarean delivery before fetal demise.

Gestational duration is most accurately determined by using either the LH surge or progesterone concentrations.<sup>1-3</sup> Parturition occurs  $65 \pm 2$  days after the LH surge, and ovulation begins 48 hours after the LH surge.<sup>1-6</sup> Owing to the extreme variability of the duration of the bitch's estrous cycle and receptive behavior, and the amount of time sperm may survive in the bitch's reproductive tract, the use of breeding dates is not an accurate method of estimating gestational age.<sup>1,2,7</sup> Parturition may occur any time from 58 to 71 days after a given breeding date.<sup>1,2,7,8</sup> In contrast, in the queen, knowledge of breeding dates is an accurate method of determining due date because they have induced ovulation, but in some cases breeding dates may not be known.

This article reviews the use of radiography and ultrasound imaging in the determination of gestational age and the assessment of fetal maturation in the bitch and queen. All estimations and calculations of gestational age and fetal maturation in this article are expressed in days after the LH surge unless otherwise noted.

## METHODS TO ASSESS FETAL MATURATION

### *Radiographs*

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#### *Factors affecting radiographic quality*

Proper radiographic technique and adequate patient restraint are critical for accurate assessment.<sup>8,9</sup> A single lateral radiograph of the abdomen is usually sufficient to allow for pregnancy diagnosis and fetal counting. Radiographs are the best method to obtain an accurate fetal count, but must be done in late pregnancy (days 57–65) to ensure mineralization is complete and reduce the chances that fetuses will be missed during evaluation.<sup>4,8,9</sup> A ventrodorsal radiograph allows measurements to be taken to assess the size of the pelvic canal in relation to fetal head size.<sup>8,9</sup> It is necessary to increase the kVP to between 4 and 10 to obtain adequate visualization of the fetal

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