



Cattle Producer's Handbook

Reproduction Section

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Effects of Management and Nutrition on Embryo and Fetal Development

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One of the main goals of cow-calf systems is to maximize pounds of calf weaned per cow exposed. Time of year at calving, weather, maternal milking ability, breed type, genetics, age of calf at weaning, herd health and vaccination programs, and post-weaning treatment of the calf are factors that may influence sale weight of the calf. The uterine environment and nutritional status of the dam have long been known to impact embryonic and fetal development. In recent years, however, we have also come to understand that the environment provided in utero may exert “carry-over effects” on the calf; that is, the effects of the uterine environment impact the growth and performance of the calf after birth and even after weaning.

Growth and development of the calf begins with fertilization of the egg within the dam's reproductive tract. Throughout the subsequent 282 days of gestation, this growth and development may be measured and observed through the use of ultrasound technology (Table 1) and, to some extent, via rectal palpation. While we are unable to visually observe the calf throughout pregnancy, it is important to note that proper management during key biological events may have a tremendous impact on calf development and performance after birth.

Pre-breeding and Early Gestation

The need for proper cow nutrition between the time of calving and the beginning of the breeding season has been well documented. Data from Houghton et al. (1990) demonstrated that thinner cows on an upward plane of nutrition from calving to breeding achieved greater pregnancy rates than fat cows losing condition during the same period. In general, however, cows should be at a body condition score (BCS) between

Table 1. Day of first detection of ultrasonographically identifiable characteristics of the bovine conceptus.

Characteristic	First day detected	
	Mean (days)	Range (days)
Embryo proper	20.3	19 to 24
Heartbeat	20.9	19 to 24
Allantois	23.2	22 to 25
Spinal cord	29.1	26 to 33
Forelimb buds	29.1	28 to 31
Amnion	29.5	28 to 33
Eye orbit	30.2	29 to 33
Hindlimb buds	31.2	30 to 33
Placentomes	35.2	33 to 38
Split hooves	44.6	42 to 49
Fetal movement	44.8	42 to 50
Ribs	52.8	51 to 55

Adapted from Curran et al. 1986.

5 and 6 on a scale from 1 to 9 (for more information, see 331) by the start of the breeding season. This is particularly important for first-calf heifers and young cows.

Once pregnancy has been achieved, the rate of fetal growth depends primarily on nutrient supply and the ability of the fetus to utilize those nutrients. During early gestation, placental growth and fetal organ development occurs (Funston et al. 2009), and nutritional insults during this period may negatively impact the calf. Additional nutrient requirements due to fetal development during this phase are minimal, but it is important to keep cows in a positive energy balance (by either maintaining or gaining weight) after artificial insemination (A.I.) or bull turnout. For cows with calves at their sides, however, early gestation coincides with