

# Texas Dairy Matters

*Higher Education Supporting the Industry*

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## The effects of heat stress on reproduction and fetal development

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### Introduction

Heat stress negatively affects dairy cattle in many ways when temperature humidity index is 68 and above. Some negative effects include: lowered milk production, reduced reproductive performance, lower feed intake, and increased culling. Several environmental factors cause heat stress, such as, high temperature, high humidity, and radiant energy (sunlight). Heat stress also causes producers and the United States dairy industry to lose an estimated \$900 million each year. With reproduction and milk production being vital parts in the dairy industry it is important to keep cows at their highest potential.

### Effects on Fetus

In dairy cattle, late gestation is a critical period when the fetus grows and accumulates approximately 60 percent of its birth weight. Heat stress on a cow in late gestation can weaken placental development which could result in fetal hypoxia, malnutrition, and even fetal growth retardation. Compromised placental development can cause oxygen and nutrient transfer to the fetus to decrease. Also, heat stress in late gestation causes a decrease in birth weight. Researchers reported that cows which were cooled gave birth to calves weighing an average of 94 pounds and cows which were heat stressed gave birth to calves weighing an average of 80 lbs. Weaning weight also decreased, calves from cooled cows weighed, on average, 173 pounds and calves from heat stressed cows weighed, on average, 145 pounds. The birth weight to weaning weight gain also decreases, with calves from cooled cows gaining 79 pounds and calves from heat stressed cows only gaining 65 pounds. Not only does heat stress in late gestation cause development issues, but it affects the immune capability of the offspring. For example, total plasma protein, hematocrit, lymphocyte proliferation, and neutrophil phagocytosis decrease, and

cellular immune function becomes compromised. Also, the fetus body temperature is dependent on fetal metabolic heat production and heat transfer with the dam. When the cows body temperature increases drastically the fetal body temperature also increases. However, a reduced fetal metabolic heat production can cause a smaller elevation in fetal body temperature which decreases uterine blood flow and oxygen delivery to the fetus. Lastly, heifers born from cows which were heat stressed during gestation produced 11.2 pounds less milk per day than heifers born from cows which were cooled during gestation. Proving heat stress not only effects the fetus while young, but ultimately it effects the fetus at every stage of life.

## **Effects on Cows**

Heat stress not only causes issues for fetal and calf development, but it can cause issues for the cow's milk production and reproduction. It has been predicted that each cow loses 306 pounds of milk each year when affected by heat stress. When the cow in late gestation becomes heat stressed and the placenta does not fully develop, the mammary function becomes impaired. When the developing mammary gland is adversely affected before parturition, lingering effects on metabolism in early lactation and lowered lactational performance can happen. Researchers reported cows dried and in late gestation in hot months produces about 1,010 pounds less milk a year than cows dried and in late gestation in cool months. It was also reported, that heat stress can accelerate uterine involution, cause smaller corpora lutea, decrease a display in natural mating behavior, increase number of inseminations by at least one insemination, increase days to cows being bred back by an average of 6 days, and increase days to pregnancy diagnosis. Lastly, the frequency of udder infections and mastitis increase during the hottest months of the year because the udder's defense mechanism decreases.

## **Conclusion**

With the negative effects heat stress can have on dairy cows, it can be concluded producers need to have heat abatement systems. Without heat abatement systems, producers may lose money each year because of loss in milk production, cows not becoming bred, weakened placental development causing calf retardation, and impaired mammary gland development.

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