

Season 3, Episode 12: In Utero Heat Stress

Dr. Jason Ross, Iowa State University, and Dr. Lance Baumgard, Iowa State University, discuss the impacts of in utero heat stress on pig development and performance.



Background

The term in utero refers to the period a developing fetus is inside the uterus of its mother. Heat stress impacts on the breeding herd are well defined, however the impact on the fetus is still an area where more research needs to be conducted. When sows are exposed to heat stress they can experience seasonal infertility, increased wean to estrus intervals as well as reduced conception rates and litter sizes. The impacts on the piglet going through gestation, during the hot summer months, also has implications that last a lifetime. Negative phenotypes, or physical characteristics, result from in utero heat stress. Ultimately, these negative phenotypes can be costly to producers.

In utero

A developing fetal pig is not able to modify its behavior to maintain a thermoneutral body temperature, therefore they are dependent on their mother to dissipate heat. During thermoneutral conditions, a sow will reduce her body temperature by almost a degree. When a sow is heat stressed her body temperature increases, this reduces the ability for the fetus to get rid of heat, giving it no choice but to get hotter. Heat stress during the first half of gestation has the most impact on the developing fetus. During the first half of gestation differentiation and programming of cells is taking place, therefore cells are more susceptible to imprinting negative impacts from the environment.

Body composition

Collaborative research between Iowa State University and University of Missouri examined piglets that were exposed to heat stress during either the first half, second half, the entire gestation, or not at all. Piglets exposed to heat stress, during any point in gestation, had increased back fat compared to piglets that had not undergone heat stress during gestation. It was also found those piglets that had been exposed to in utero heat stress had higher circulating insulin levels in their blood, throughout their entire lives. Increased levels of circulating insulin ultimately cause increased fat synthesis and deposition, which is an inefficient use of energy resources. Another study confirmed these differences in body composition. Negative impacts on body composition also have implications at the packer level. For example, packers may see measurable differences in the amount of back fat depending on the time of year.

Future possibilities

Ultimately, maximizing profit and performance potential of growing pigs starts at conception. There is still a wealth of knowledge that can be gained in this area. Environmental conditions in utero, such as heat stress, have lasting implications on all progeny a sow produces. As more knowledge is gained it will open the doors to specific sow management strategies depending on time of year and point of gestation. For example, additional cooling of sows during specific intervals of gestation. We have only begun to uncover the possibilities.

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