Cause of seasonal infertility in sows studied at ISU

Animal scientists at Iowa State University, in Ames, IA, United States are searching for reasons and solutions for seasonal infertility in sows, including what may be the first scientific study of insulin's possible role in the problem.

Aileen Keating and Jason Ross, assistant professors of animal science, estimate that seasonal infertility costs producers the US most important swine state about $60 million a year. Nationally, the losses to the swine industry are approximately $420 million annually.

"After a long, hot summer, pigs have problems with either getting pregnant or maintaining a pregnancy," said Keating.

Other ISU scientists are studying heat stress in pigs. It was exposure to that study and Keating's knowledge of reproductive physiology and ovarian dysfunction that triggered her interest in studying the possible role of insulin.

The research is supported by a grant from the Iowa Pork Producers Association.

Keating knew that the sows in the heat-stress study had high levels of insulin. She also knew that high circulating insulin levels and problems with infertility and maintaining a pregnancy are common among obese women.

"When women are obese, they have problems with fertility," Keating said. "Obese women don't ovulate very well and even when they are medically induced to ovulate, their eggs are not very good quality. In women, obesity is associated with high circulating insulin levels."

When pigs are heat-stressed, they don't eat much. But even though they aren't eating, heat stress causes elevations in circulating insulin.

“That’s the opposite of normal in any animal,” she said. “Normally, when animals eat, you have a high level of blood glucose and then insulin is released to get blood glucose levels back to normal. So usually insulin goes up after you’ve eaten. But these heat-stressed animals have suppressed feed intake.”

Keating called it a “weird physiological phenomenon” that she was interested in exploring because seasonal infertility is such a huge economic cost to Iowa producers.

She believes they may be the first scientists to study a potential insulin link to seasonal infertility in swine.

The $53,000 one-year IPPA grant is allowing Keating and Ross to conduct research on the ovaries of the pigs in ISU’s heat stress studies.

Early findings indicate that there may be changes to the pathway that makes oestrogen in the ovary of a heat-stressed pig, which could play a role in seasonal infertility.

“If you don’t have an estrogen release, you don’t have ovulation. In pigs, it’s also what’s needed for them to display they are in heat and to be inseminated. Estrogen is also necessary for maternal recognition of pregnancy. So when a pig has a fertilised egg, estrogen is what signals to the pig’s body to provide support for growth and not reject the egg as a foreign invader. We want to know more about what’s happening with estrogen levels in pigs and the seasonal infertility issue,” said Keating.

Keating is hopeful that during the IPPA-funded study they may begin to identify therapies or intervention strategies. Additional research will be needed, including conducting trials, before any recommendations can be made to producers.

“In the future, we would like to be able to do some larger trials employing mitigation strategies that are applicable to Iowa. We would like to be able to identify something that could make a difference and do something that helps the economy. If we can come up with a kind of therapy or intervention strategy, it could save a lot of money for Iowa producers and those around the US and abroad. This is a global problem,” she said.

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