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Identification of measures predictive of age at first puberty

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Improving sow lifetime productivity is essential for U.S. pork producers to remain competitive and to meet the increasing worldwide demand for animal protein. Despite the critical need to improve sow lifetime productivity, genetic selection has been met with reduced effectiveness as the complexity of the selected trait can be significantly impacted by postnatal environment. Several factors are known to be valid indicators of potential lifetime productivity such as feet and leg conformation and age at first puberty. Age at first puberty represents a useful phenotype that can be utilized to select or reject gilts prior to entering the replacement gilt pool. A significant downside is that age at first estrus is not always documented as it is labor intensive to initiate estrus detection measures several months prior to breeding. This results in the inclusion of gilts in the replacement pool that will not demonstrate an estrous cycle prior to day 180. The central hypothesis of this project is that gilts demonstrating tertiary follicle development on their ovaries earlier in life are more likely to achieve puberty earlier compared to counterparts of a similar age and weight lacking tertiary follicle development. The objective of this project was to identify markers and specific time-points during pre-pubertal development that could be utilized as valid indices to predict age of first puberty. To accomplish this, we utilized 155 gilts of similar age (± 2 days). On postnatal days (PND) 75, 85, 95, 105 and 115, gilts were weighed and blood drawn for serum isolation. Additionally, vulva width, length and area were recorded. At each time point, 10 gilts were sacrificed

and uterine wet weight was recorded in addition to ovarian follicular activity. Estrus detection was conducted daily on PND days 126 to 200 for the remaining 105 gilts. Mean vulva area (VA) on PND 75, 85, 95, 105 and 115 was 596 ± 206 , 683 ± 190 , 864 ± 212 , 1014 ± 228 and 1265 ± 252 mm², respectively. Of the gilts demonstrating behavioral estrus, 28 were within PND 140-160, 37 between PND 161-180, 14 between PND 181-200, while 26 did not demonstrate estrus within 200 days of age. All gilts euthanized at PND 75 lacked follicular activity as defined by having a minimum of two antral follicles per ovary, while 6/10, 8/10, 9/10 and 10/10 demonstrated follicular activity on PND 85, 95, 105, and 115, respectively, demonstrating that PND 75 to 115 is the approximate window for first follicular activity. The use of VA at PND 95 may be predictive of age of first puberty. Of those gilts whose VA was less than one standard deviation from the mean on PND 95 (i.e. < 652 mm²), 31% and 50% demonstrated their first behavioral estrus by PND 180 and 200, respectively. However, of those gilts whose VA was within or greater than one standard deviation from the mean (i.e. ≥ 652 mm²), 66% and 79% exhibited estrus prior to PND 180 and 200, respectively. Further analysis of blood estradiol concentration and its ability to correlate to vulva development and age of first estrus is ongoing. This project was supported by the National Pork Board.

