HORMONAL CONTROL OF PIG REPRODUCTION

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INTRODUCTION

In order to consistently reach breeding targets and maintain weaned pig production, sufficient service-ready gilts must be available in each breeding week. If enough gilts are not available in a predictable manner, subsequent pig production will suffer. To minimize the potential of gilt supply being a constraint to achieving the breeding target, large gilt pools are maintained to help ensure that an adequate number of gilts will be in estrus and available for breeding at specified times. Having replacement gilts exhibit estrus at a predicted time would allow more efficient scheduling and use of gestation and farrowing facilities and provide greater opportunity for introduction of females into sow groups at the time sows are bred following weaning. Reproductive efficiency could be enhanced with the use of effective methods for synchronizing estrus in replacement gilts and weaned sows that do not return to estrus when expected. The available methods of estrus synchronization in swine are varied, but they are all based either on controlling events leading to follicular maturation and ovulation or altering luteal lifespan. Before considering how available hormonal products can be used to manipulate reproduction in pigs, an understanding of how hormones naturally control the estrous cycle is necessary.

REPRODUCTIVE PHYSIOLOGY IN PIGS

Once gilts reach puberty at 6 to 8 months of age, they display estrus at 18- to 22-day intervals unless cycling is interrupted by pregnancy and lactation, poor nutrition, or disease. During estrus, gilts or sows stand to be bred. The physiological and behavioral changes associated with the estrous cycle are controlled by hormones produced by endocrine glands. Gonadotropin-releasing hormone (GnRH) is released from a specific area of the brain called the hypothalamus, travels through blood vessels to the pituitary gland, and there stimulates secretion of follicle-stimulating hormone (FSH) and luteinizing hormone (LH). These are called gonadotropins.

During the two to three day period just prior to estrus, increasing blood levels of FSH and LH cause follicles to rapidly grow on each of the two ovaries. These follicles secrete increased levels of the hormone estrogen into circulation, which in turn causes the behavioural and physiological changes associated with estrus (e.g., reddening and swelling of the vulva, lordosis or the "standing response" in the presence of a boar, etc.). Rising concentrations of estrogen eventually triggers increased secretion of GnRH, resulting in a massive release of LH during estrus. This "LH surge" stimulates the process of ovulation. Multiple ova, or eggs, are released from the follicles on the ovaries during the process of ovulation, which occurs, on average, 40 hours after the onset of estrus. Each ovulation site on the ovaries subsequently forms a structure called a corpus luteum which secretes another hormone, progesterone, into the circulation. During the

luteal phase of the estrous cycle, (or if pregnancy occurs), progesterone, in concert with low levels of estrogen, inhibits FSH and LH secretion from the pituitary gland, and thus inhibits follicular growth. Ova are fertilized in the oviducts, which are tubes connecting the ovaries and uterus. The embryos then progress to the uterus and develop into fetuses.
If fertilization and initiation of pregnancy did not occur during estrus, then the hormone prostaglandin-F2α (PGF2α) is secreted into circulation from the uterus around day 16 of the estrous cycle. PGF2α causes the regression or death of the corpora lutea and as a result, progesterone levels decline. Decreasing levels of progesterone allow GnRH, and hence, FSH and LH to increase, follicles develop, and the gilt continues to cycle. In weaned sows, the wean-to-estrus interval is equivalent to the follicular growth phase of the estrous cycle.

HORMONAL PRODUCTS

PG 600 – is made up of 400 IU PMSG (or eCG equine chorionic gonadotrophin) and 200 IU hCG (human chorionic gonadotrophin). eCG has an FSH effect (follicles develop and mature, sows show estrus), while hCG has an LH effect (causes ovulation).
PG600 is used to induce cyclicity in prepubertal gilts or in non-cycling weaned sows.
When PG 600 is administered to prepubertal gilts, commonly up to 30% may not exhibit behavioural estrus.

Some eCG preparations are available and sometimes are used alone to induce estrus, since eCG has the effect of FSH. When using eCG alone, higher doses (900 vs. 600 IU) may improve the response of parity-one sows. GnRH (gonadotrophin releasing hormone) and porcine luteinizing hormone (pLH) have an LH effect and are sometimes used to stimulate or synchronize ovulation after induction of estrus or at the first sign of estrus. If ovulation can be synchronized, it may be only necessary to breed sows once to achieve pregnancy.

PGF2α can be used for synchronization of sows or gilts by aborting early pregnancies (CL must be present). Following this induced abortion, sows or gilts may return to estrus 3-5 days later. This can be done to have these sows or gilts in estrus at a desired time. For induction of farrowing, PGF2α should be given 2 days before expected farrowing. The manufacturer's recommendation is to give IM in the neck, but injecting in the vulva with half of the dose gives a similar response. There are some analogues of PGF2α that may be used in a similar manner.

Altrenogest (Regumate or Matrix) is an orally active progestin and has progesterone-like activity. When Altrenogest is fed to a group of cyclic gilts or weaned sows, there is a suppression of gonadotropin secretion and, as a consequence, growth of follicles on the ovaries is inhibited. Ideally pigs should be individually fed so they can consume the required dose, which is usually fed for 14-18 days. Since estrus suppression is only needed from the time of luteal regression, if cycle dates are known, costs can be minimized by feeding Altrenogest from approximately 13 days after estrus detection until 5 days before scheduled breeding. When Altrenogest treatment is stopped, gonadotropin secretion increases and follicular growth ensues. Research has shown that up to 90-95% of gilts may show estrus on days 4-8 after the last feeding.

CONCLUSIONS

There are various hormonal and pharmaceutical products that may be used to manipulate swine reproduction. These tools are not meant to be a substitute for adequate management, and for best results compliance with protocols is required. A cost-benefit analysis should always be done to determine the real value of adopting any of these intervention strategies.

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