

**Aspects of Endocrine and Ovarian Maturation
during Puberty in the Gilt**

Anton Pressing, PhD, North Carolina State University, Department of Agriculture, 1989

ABSTRACT

Three studies were conducted in prepubertal gilts from 50 to 190 d of age: 1) to correlate surface follicle (SF) development and concomitant LH secretion, 2) to investigate ovulatory and endocrine responses to hourly administration of GnRH, and 3) to study LH release after ovariectomy and three physiological doses of exogenous estrogen.

Study 1. Frequent blood sampling periods and laparoscopies were conducted every 10 d for eight gilts from 50 to 120 d of age. LH pulse frequency increased first between 50 and 60 d of age from $1.4 \pm .4$ to $3.6 \pm .3$ pulses/6 h, mean LH from $0.7 \pm .14$ to $1.2 \pm .15$ ng/ml and baseline LH from $0.3 \pm .06$ to $0.6 \pm .08$ ng/ml. All three measures attained maxima of 5.6 pulses/6 h, $1.5 \pm .10$ ng/ml and $0.9 \pm .06$ ng/ml, respectively, at 80 d of age. The mean age of gilts when SF were first observed was 81.3 ± 2.3 d, the mean number of SF 3.9 ± 1.6 , and average diameter of SF $4.6 \pm .5$ mm. SF numbers increased until 120 d of age to approximately 61 ± 3.8 , whereas pulsatile LH release underwent a progressive decline. These findings demonstrate that increased pulsatile LH release accompanied by elevated baseline levels precedes and accompanies development of SF in the prepubertal gilt.

Study 2. Six gilts each at 70, 100, 150 and 190 d of age were assigned either to treatment with GnRH or saline alone. Bolus infusion of GnRH (50 μ g/kg) resulted in LH peak concentrations of 6.0 to 13.4 ng/ml. Hourly administration of GnRH initiated a cyclic pattern of hormone release accompanied by ovulation in two 70-day-old and all older gilts. In 100-day-old or older gilts, peak estradiol (E2) concentrations of 41 to 49 pg/ml were reached within 88 ± 2.9 h, peak LH levels of 7.5 to 12.7 ng/ml within 103 ± 3.3 h, and progesterone (P4) concentrations of 11 to

15 ng/ml within 199 ± 4.6 h after initiation of pulsing. The number of corpora lutea (CL), 12.7 ± 0.7 , was similar for 100-day-old or older gilts. In two 70-day-old, ovulating gilts, endocrine responses were delayed by 3.5 days, and the number of CL, 4.5 ± 1.1 , was reduced. Comparable endocrine or ovulatory responses were not observed in saline-treated or four 70-day-old, GnRH-pulsed gilts. These findings suggest that ovarian responsiveness to endogenous gonadotropins becomes established between 70 and 100 d of age.

Study 3. The study included 12 gilts each at 50, 70, 90, 110 and 150 d of age. All gilts were ovariectomized on Day 0. Three gilts each were assigned to treatment with E2 implants of three sizes or sham implants on Day 6. Implants were removed on Day 12. Blood samples were taken every 4 h from Day -3 until Day 15, and every 15 min for 6 h on Day -1, 4 and 9. Mean LH increased between Day -1 and Day 4 in gilts at 70 d or older, and LH pulse frequency in gilts at 90 d of age or older. The difference between pre- and postcastration LH release was largest in 110- and 150-day-old gilts. Negative feedback to various size E2 implants remained the only response until 70 d of age. Temporary LH suppression followed by a surge-like LH release was first observed in two 90-day-old gilts treated with the high implant dose. Biphasic LH responses increased with age and were observed in seven 110-day-old gilts, treated with the low (1) and medium (3) or high implant-dose (3), and all 150-day-old gilts independent of E2 dose. These findings demonstrate that negative ovarian feedback becomes established at the time of surface follicle development between 70 and 90 d of age. Secondly, while negative feedback responses to exogenous estrogen are operative in the infantile gilt, sensitivity of the positive feedback mechanism to estrogen substituted at different physiological levels undergoes a gradual maturation between 90 to 150 d of age.