OVULATION RATE IN GILTS AFTER SHORT-TIME EXPOSURE TO CONTINUOUS LIGHT*

D. G. WADDILL, C. H. CHANEY AND R. H. DUTT

*Department of Animal Sciences, University of Kentucky,
Lexington, Kentucky, U.S.A.*

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Summary. Ovulation rate in gilts maintained under continuous light (daylight plus 118 to 130 lux of artificial light at night) for a complete oestrous cycle during the spring months was not significantly different from that in gilts maintained under normal daylight. Average ovulation rates were 13·4 for controls and 13·1 for treated gilts. A significant ($P < 0.01$) difference in ovulation rate was found between years.

Sykes (1956) has reported that reduced light decreases egg production in chickens, and McCluskey & Parker (1963) reported delayed sexual maturity and lowered egg production in chickens maintained under reduced periods of light. Martinet (1963) and Pelletier & Ortavant (1964) reported that sexual activity of the field vole and secretion of gonadotrophic hormones vary with season in both the male and female of this species. Furthermore, Martinet (1963), showed that sperm production and ovulation could be increased in the field vole with variation in the light–dark ratio. Thibault, Courot, Martinet, Mauléon, Du Buisson, Ortavant, Pelletier & Signoret (1966) reviewed data showing that for certain species there appears to be an optimum duration of the daily light–dark ratio under which gametogenic activity is highest.

In view of the importance of the light–dark ratio on the reproductive processes of birds and certain mammals, this study was initiated to determine whether a continuous light regime for gilts for one oestrous cycle would alter ovulation rate significantly.

In Trial 1, conducted during the spring (April) of 1965, eighteen cycling Yorkshire gilts were divided equally between a control and a light group at an average age of 7½ months. The gilts were maintained on concrete-floored pens 2·4 m wide and 6·1 m deep with a roof covering one-half of the floor area. Gilts were group fed daily 2·72 kg of corn–soybean meal ration containing 15% alfalfa meal. The ration contained 14% protein and vitamins, and minerals were supplied to meet the National Research Council's (N.R.C., 1959) recommendations.

All gilts were checked daily with a boar and when found to be in oestrus were transferred to control or experimental pens of similar areas. The gilts to be subjected to light were placed in a pen equipped with lights. Light

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intensity at night was 130 lux in the centre and 118 lux at the sides of the pens about 0.5 m from the floor. Lights were turned on at 17.00 hours and off at 08.00 hours daily by an automatic switch. Control gilts were placed in pens not supplied with artificial light.

All gilts were maintained in the experimental pens throughout one oestrous cycle and were slaughtered 5 days after the first treatment oestrus. Immediately after slaughter the ovaries were removed, and the corpora lutea were counted to determine ovulation rate.

Trial 2 was conducted during April 1966 with a total of twenty cycling Yorkshire gilts (ten control and ten treated). Treatments and the experimental procedure were identical to that used for Trial 1. The data from both trials were subjected to analysis of variance.

The results from both trials are summarized in Table 1. There were no significant differences in ovulation rate between the gilts exposed to constant

TABLE 1
EFFECT OF EXPOSURE TO CONTINUOUS LIGHT FOR ONE OESTROUS CYCLE ON
OVULATION RATE IN GILTS

Item	Trial		Treatment	
	1 (1965)	2 (1966)	Control	Continuous light
No. of gilts	18	20	19	19
Average ovulation rate	14.4*	12.2	13.4	13.1
Average age at slaughter (days)	244.5*	256.5	251.8	249.7
Average weight at slaughter (kg)	130.2*	112.0	120.3	120.9

* Significant ($P < 0.01$) difference between trials.

light and the control gilts in either trial. Average ovulation rates for the control and treated groups were 13.4 and 13.1, respectively. Gilts in Trial 1 produced significantly ($P < 0.01$) more ova than those in Trial 2 (14.4 *versus* 12.2), even though average ages at slaughter were 244.5 and 256.5 days, respectively. Average ages at slaughter for the control and treated groups did not vary significantly (251.8 *versus* 249.7 days). Gilts in Trial 1 were significantly ($P < 0.01$) heavier at slaughter than those in Trial 2 (130.2 *versus* 112.0 kg). However, average weights of the gilts in the control and treated groups at slaughter were similar (120.3 and 120.9 kg, respectively).

Seasonal differences in litter size in swine have been reported by Johansson (1929) and in ovulation rate in swine by Gossett & Sorenson (1959). Warnick, Wiggins, Casida, Grummer & Chapman (1951) observed a difference between years in the age at onset of puberty in gilts (236 *versus* 251 days), and they also noted that within lines the faster growing gilts reached puberty at a younger age. The breeding of gilts in both trials in the present study was similar, and in view of the findings of Warnick *et al.* (1951), relative to the effect of weight at puberty, it appears that the heavier weight of the gilts in Trial 1 may partially account for the significant increase in ovulation rate. The significantly younger age at slaughter for the gilts in Trial 1, along with the higher ovulation rate, seems to support the conclusion of Warnick *et al.* (1951) that within lines

faster growing gilts tend to reach puberty at a younger age and that factors which tend to delay puberty also tend to depress ovulation rate.

Martinet (1963) showed that length of light exposure is a critical factor in normal reproduction in field voles. Spermatogenesis, as measured by testis weight, was lower in voles subjected to 5 or 10 hr of light during the first 70 or 114 days of their life than in those subjected to 15 or 20 hr of daily light. In females, Graafian follicles and ovulation rates were significantly higher in voles receiving 15 *versus* 5 or 10 hr of daily light. Thibault *et al.* (1966) reported that the optimum duration of daily light for highest gametogenic activity in sheep was 10 to 12 hr. Dutt (1965) reported that short-time exposure to continuous light during the sexual season tends to increase ovulation rate in ewes.

Results of the present study should not be interpreted as providing evidence that light has no influence on ovulation rate in swine. During April (spring) the amount of daily light may be sufficient to elicit optimum ovulation response in the cycling gilt, and it is possible that ovulation rate in swine may be lower during seasons with more restricted light periods. This hypothesis was not tested.

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