ISSN 0189-0514
J. Anim. Prod. Res. (2016) 28(2):55-60

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FERTILITY IN RABBIT DOES ADMINISTERED HUMAN CHORIONIC GONADOTROPIN UNDER NATURAL MATING

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ABSTRACT

An experiment was carried out to investigate the influence of human chorionic gonadotropin hormone (hCG) on the fertility rate of naturally mated rabbit does. The rabbit does of about 7-8 months were used for the trial. Human chorionic gonadotropin hormone was administered to the does at varying levels of 0, 75, 150, 225 and 300 I.U, designated treatments 1, 2, 3, 4 and 5, respectively. Twenty five rabbit does were divided into five groups with five does per groups. The groups were randomly allotted to the five treatments in a completely randomized design. The study lasted 5 weeks. The results showed that does on 0 and 75 I.U had 60 and 50% conception rate, respectively while does on 150 and 300 I.U had 20% conception rate, however does treated with 225 I.U had no conception rate. There were no significant differences in the weight of does before and after birth, gestation length and litter weight and average litter weight. Number of live kits at birth and litter size showed significant ($p<0.05$) difference across the treatments. The results of this study show that hCG influenced the fertility rate of rabbit does. It is recommended that hCG should be administered at 75 I.U for optimum conception rate and litter size.

Keywords: Human chorionic gonadotropin, Fertility rate, Rabbit does, Natural mating

INTRODUCTION

Rabbits (*Oryctolagus cuniculus*) are medium sized, hoping animals with long hind legs and ears and short tail. They are often referred to as pseudo-ruminants because they eat a great deal of forages and can utilize them well due to the presence of bacteria in their caecum (Fielding, 1991). They form the bridge between monogastric and ruminants due to their ability to subsist on both forage and concentrate and hence they are often referred to as monogastric herbivores. Rabbits can efficiently utilize forage and fibrous agricultural by-products (Cheeke, 1986) and do not compete directly with man for grain products (Shiawoya and Adams, 2004). Therefore, rabbit meat production is relevant for countries with no cereal surpluses like Nigeria (Oladunjoye *et al.*, 2005).

The rabbit belongs to a group of mammals which do not have an oestrus cycle and ovulation requires stimulus of mating through a neuro hormonal reflex action initiated during mating. (Theau-Clement, 2000). Ovulation is normally induced by the stimuli associated with coitus and occurs ten to 12 hours after mating. The mechanisms by which rabbit does ovulate are still unclear, but are likely associated to factors interfering with the control of the gonadal axis involving the hypothalamic centers responsible for GnRH release (Theau-Clement *et al.*, 2008). However, Luteinizing hormone (LH) or hCG can be used to artificially induce ovulation in rabbit does (Foote *et al.*, 1963). However, repeated injection of these hormones can result in failure of the does to ovulate as a result of antibody formation (Adams, 1972).

Sexual stimulation without copulation or in response to exogenous gonadotropins makes ovulation take place. This type of ovulation often results in does becoming pseudo pregnant or sterile for few days (Kalaba *et al.,* 2011). Ovulation is apt to occur within the range of 9-13 hours. But, generally it takes place at least 10 hours following mating. It is thought that does may remain in constant heat throughout the year or in breeding season. But, it is known that follicles develop and regress in cycles of 15-16 days. There is a lack period when the doe may lose interest for the buck. Ovulation can also be induced through mechanical stimulation of vagina (Kalaba *et al.,* 2011).

Since rabbit are induced ovulators, hormonal influence on ovulation of animal could be essential in enhancing conception in does when mated. The current study was designed to assess the influence of human chorionic gonadotropin on the fertility rate of naturally mated rabbit does.

MATERIALS AND METHODS

Experimental Site

This experiment was carried out at the Rabbitry Unit of Teaching and Research Farm of the University of Ibadan, Oyo state, Nigeria. The rabbitry lies between latitude 7'27^{0}N and longitude 3'54^{0}E. It is about 200 – 300 meters above sea level.

Experimental animals and management

Twenty five (25) female rabbits (does) were used for this experiment. The rabbits were purchased from reputable farms in Ibadan. The animals were allowed an acclimatization period of two weeks. The animals were housed in individual wooden hutch (55cm x 40cm x 40cm). They were fed *ad libitum* with commercial feed that contained 17.78% CP, 7.55% CF and 2525.2kcal/kg metabolizable energy.

Experimental Layout

The experimental rabbits were randomly allotted to five treatments with five replicates per treatment. Human Chorionic gonadotropin hormone was administered to the rabbits does before mating at varying dosage levels of 0, 75, 150, 225 and 300 I.U which constitute treatments 1, 2, 3, 4 and 5, respectively. The does were mated to proven bucks in such a way that the male effect was randomized among the treatments by allowing each buck to mate one doe from each treatment.

Fertility Rate Evaluation

To evaluate fertility rate of the does, the following parameters were measured. The percentage conception rate was determined by the numbers of animals that kindled in a treatment divided by the total number of animals in the treatment multiply by 100. Gestation length was determined as the period of conception to period of parturition in rabbit does and recorded in days. Litter size was determined as the numbers of kits per doe per treatment. The weight of kits (in grams) was determined by weighing the kits using a weighing scale. Average litter weight was measured by dividing the sum of the weight of all the kits by the litter size and expressed in grams. Number of live kits at birth was also determined by counting the number of kits that were alive at the time of kindling.

Experimental Design and Data analysis

The experimental design was complete randomized design. Data collected were subjected to descriptive statistics and one-way ANOVA (SAS, 2003) and means were separated using Duncan Multiple Range Test of the same software.

RESULTS AND DISCUSSION

The results of the reproductive performance of naturally mated does synchronized with hCG are presented on Table 1. It was observed that none of the does on treatment 4 conceived. The conception rates of the does on treatments 1, 2, 3 and 5 were 60%, 50%, 20% and 20% respectively (Figure 1).

The gestation length of does on treatments 2, 3 and 5 were not significantly (P>0.05) different from does on control. The litter size of the does in treatments 1, 2 and 5 were not significantly different (P<0.05) from that of does on treatment 3.

Number of live kits at birth (6.00±0.00) and doe weight after kitting (2790g) were significantly (<0.05) higher in does on treatment 3 than in does on the other treatments (treatments 1, 2, and 5) which were not significantly different from one another. The least values for the same parameters were recorded in does on treatment 2.

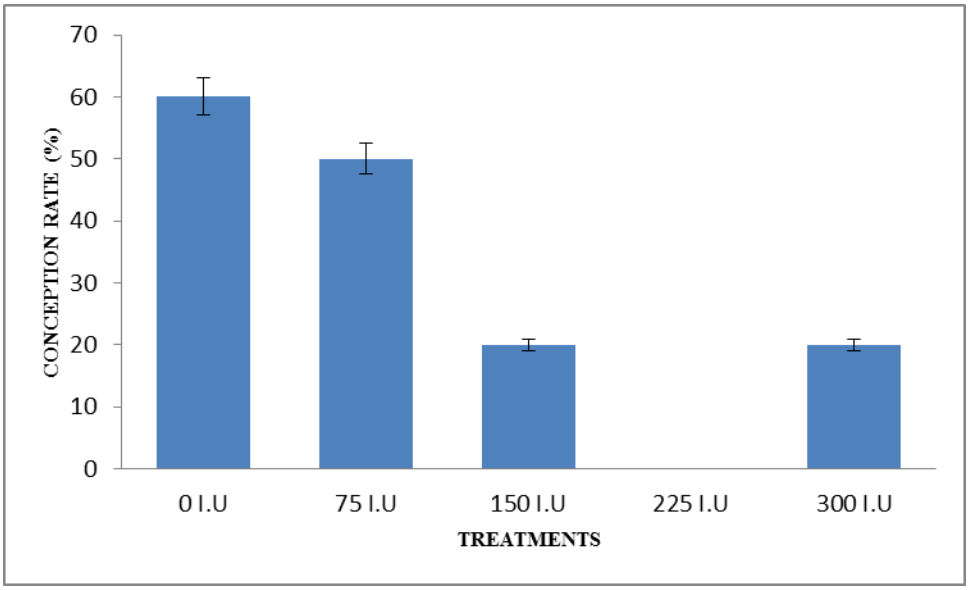

Figure 1: Conception rate of naturally mated rabbit does administered human chorionic gonadotropin hormone.

The similar gestation length in rabbit does administered human chorionic gonadotropin was at variance with the result obtained by Afifi and Emara (1984) and Hilmy (1991) who used prostaglandin injection instead of hCG and reported shorter gestation period which was attributed to the greater number of litter size at birth (8.46) as compared to positive and negative control (4.43 and 4.94, respectively) in their studies. It was observed that the gestation period decreased linearly with the increase of litter size at birth. The significant effect of the hormone

on the litter size agrees with those obtained by Abd-El-Glil (1993) and Kirrella *et al.* (1995). These results may be attributed to the hormone causes regression of the corpus luteum and the cycle repeats itself (Niswender *et al.,* 2000), increase secretion of luteinizing hormone (LH) (Carlson *et al*., 1977) and as a result of the increase of LH, ovulation of the mature follicle occurs followed by various sequential processes that led to increase in conception and litter size at birth.

Table 1: Influence of hCG on Fertility Rate of Naturally Mated Rabbit Does

PARAMETERS	T1 (Control)	T2 (75 I.U)	T3 (150 I.U)	T4 (225 I.U)	T5 (300 I.U)
Weight of doe before birth(g)	2152.70±429.57	2102.50±153.44	2385.00±7.07	-	1597.00±2.83
Gestation length (days)	32.33±0.58	32.00±0.00	32.00±0.00	-	32.00±0.00
Weight of doe after birth(g)	2301.00±405.95	2238.00±173.95	2790.00±2.83	-	1780.00±2.83
Number of live kits at birth	2.67 ± 0.58^{bc}	2.00 ± 0.00^{c}	6.00 ± 0.00^{a}	-	3.00 ± 0.00^{bc}
Litter size	3.33 ± 1.15^{b}	2.00 ± 0.00^{b}	6.00 ± 0.00^{a}	-	3.00 ± 0.00^{b}
Litter weight (g)	132.33±57.20	84.00±8.49	123.00±2.83	-	90.00±0.00
Average litter weight	39.77±9.01	42.00±4.24	20.49±0.47	-	30.00±0.00

a,b,c: Means along the same row with different superscript are significantly different ($P<0.05$)

The litter size of the rabbit does improved significantly and the highest value for litter size was recorded in treatment 3. However, Zapletal *et al*. (1990) reported that the total annual fertility rate was higher (73.02%) in rabbit group treated with lecirelin (GnRH) but with higher litter size has a total and live born (9.82 and 9.70, respectively) than those obtained in the present study. It has been shown that GnRH mediates the hypothalamic control of pituitary gonadotropin secretion and biosynthesis (Dekel *et al.,* 1988) to induce ovulation. However, the obtained improvement in kindling rate and litter size of rabbit does treated with GnRH as compared to the controls in this study was also due to the effects of GnRH on the ovary include stimulation of oocyte maturation (Dekel *et al.,* 1988; Yang *et al.,* 1995).

The number of live kits at birth was also highest in treatment 3 treated with 150i.u hCG. This result was at variance with report of McNitt *et al.* (1997) indicated that total kits born per litter and kits born live per litter are the best by using PGF compared to the control. However, Lavara *et al.* (2002) found that no significant differences for litter size at birth and live-born kits when cloprostenol was used. Besides, Pimenta *et al.* (1996) and Mollo *et al.* (2003) obtained the same results with using natural PGF2alpha in comparison to does treated with PMSG or to untreated

does. The observation in this study established that the use of hCG could not increase percentage conception than untreated group under natural mating.

CONCLUSION

It can be concluded that the use of human Chorionic Gonadotropin induced ovulation at optimal dose of 75 I.U with increased percentage conception rate than higher doses. However, under natural mating, the use of hCG at higher dosage above 75 i.u/doe depressed fertility rate as the concentration increases. Therefore, the use of the hormone may not be necessary for ovulation induction under natural mating.

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