EFFECT OF PROSTAGLANDIN $F_{2\alpha}$ AND OXYTOCIN ON SEMINAL CHARACTERISTICS IN CHHOTTANAGPURI RAMS*

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Received : 21.02.2014 Accepted : 26.05.2014

ABSTRACT

A study was conducted on chhottanagpuri ram to see the effect of oxytocin and prostaglandin F2α on seminal characteristics. Immediately after semen collection, all the semen samples were brought to the laboratory and were evaluated for colour, ejaculate volume, mass activity, pH, sperm concentration, live sperm percentage and abnormal sperm percentage. There was significant ($p<0.01$) increase in ejaculate volume, sperm concentration and sperm head abnormalities after prostaglandin administration. It was also found that oxytocin administration increases ejaculate volume, mass activities and sperm concentration of semen significantly ($p<0.01$) during this study.

Keywords: Prostaglandin $F_{2\alpha}$, Oxytocin, Chhottanagpuri ram, Semen

INTRODUCTION

Chottanagpuri sheep is a good mutton type breed of Jharkhand. Conservation of superior germplasm of this breed and their propagation through artificial insemination technique is essential. Research conducted on Chottanagpuri rams to see the effect of prostaglandin $F_{2\alpha}$ and Oxytocin administration on seminal characteristics. The first hormone prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) increased the total number of spermatozoa in the ejaculate of bulls; buffalo bulls and rams (Mekonnen *et al,* 1989; and Dighe, 1995, Olfati, 2013). The actual mechanism behind the increase in ejaculate volume and concentration in response to $PGF_{2\alpha}$ is not fully understood. However, it is thought that $PGF_{2\alpha}$ acts directly on the contractile tissue of the testicular capsule and epididymis causing an increased rate of sperm passage from the epididymis to the ductus deference. The effects of different doses of prostaglandin on seminal attributes have been reported by Hafez (2003).

The second hormone, Oxytocin has also been shown to increase sperm output in buffalo bulls, rams and boars (Ibrahim, 1988; Ciftci, 2005 and Bozkurt *et al.,* 2007). Oxytocin is also thought to influence the secretion rate of the male accessory sex glands, which may account for the increased volume in rams and boars following administration (Ciftci, 2005; Bozkurt *et al.*, 2007). The increase in sperm number following Oxytocin administration has been attributed to an increase in smooth muscle contraction surrounding epididymis, which enhances spermatozoa movement into the deferent duct. Sperm transfer in male is partly regulated by Oxytocin, which increases the gonadotropin secretion and stimulates spermatogenesis (Melin, 1965). Exogenous administration of Oxytocin causes the effective sperm transport in genital ducts.

*Part of M.V.Sc. Thesis submitted by 1st Author Deptt. of ARGO, R.V.C. Ranchi-6

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MATERIALS AND METHODS

Six adult rams of chottanagpuri breed belonging to instructional farm small ruminants, Ranchi veterinary college, having good sexual behaviour and andrologically non-detectable abnormalities were selected for the present research work. All these six rams were maintained under similar environmental and managemental conditions. These rams were allocated to two groups (oxytocin treatment and prostaglandin $F_{2\alpha}$ treatment groups), each comprising of three rams semen was collected by artificial vagina method from all the six rams of both the two groups twice weekly for three weeks. Six ejaculates were taken from each ram in each group. Thus, a total of eighteen collections were taken from three rams in each group. Soon after collection, the semen was carried out to the laboratory for evaluation of different seminal attributes. Semen samples were collected from rams after administration of oxytocin (n = 3) in one group and prostaglandin $F_{2\alpha}$ (n = 3) in other group and was evaluated for its attributes. Ejaculates were collected from the three rams after 10 minutes of intramuscular injection of oxytocin 7 unit. Two collections per week per ram were taken for five weeks. A total of ten collections from each ram were taken thus, a total of 30 collections from the three rams. This group received PGF2α at the dose rate of 0.1mg/kg body weight 30 minutes before collection. Ten ejaculates were taken from each ram, thus a total of 30 collections were done.

Immediately after semen collection, all the semen samples collected during phase 1 and phase 2 were brought to the laboratory and were evaluated for colour, ejaculate volume, mass activity, pH, sperm concentration, live sperm percentage and abnormal sperm percentage as per methods described by Saxena, (2000). Shortly after collection, each semen sample was examined for mass motility of sperm and was graded grossly into five categories (5+ to 1+)

Immediately after collection, a drop of each ejaculate was placed on a clean, sterile glass slide and kept on a biotherm stage at 37 degree centigrade. The slide was examined under low magnification of the microscope (10 X). Mass motility percentage was assessed on the basis of vigour of wave motion of the spermatozoa in mass and was graded grossly into the following 5 categories:

+5 **Motility:** When there were very quick swirling waves.

+4 **Motility:** When swirls and eddies were not as rapid as in +5 grades and observed to move towards extremities.

+3 **Motility:** In this case swirls were slow and scattered in the field. Individual movements of spermatozoa were discernible.

+2 **Motility:** In this category the swirls were absent and individual movement of spermatozoa were more evident,

+1 **Motility:** In such samples no wave motions were observed and only about 20% of spermatozoa had progressive movement. Rest of the spermatozoa showed throbbing movement.

In between the two grades the values were recorded as +4.5, +3.5, and +2.5 according to the condition of the neat semen sample.

For determining sperm concentration in semen samples, Neubauer haemocytometer was used and done as described by Saxena, (2000). Percentage of live spermatozoa was calculated by the method advocated by Saxena (2000) using eosin nigrosin stain. The smears prepared for live sperms were used to calculate the percentage of abnormal sperms (Saxena, 2000). The statistical analysis of data was done as per standard method described by Snedecor and Cochran (2004).

RESULTS AND DISCUSSION

Various seminal attributes of all the ejaculates collected from all the rams before and after treatments were noted and the results have been presented as follows.

Colour of neat semen in all the rams of both the groups in this study was found to be creamy or creamy white which were similar to the findings of Bharti *et al* (2009) in Chottanagpuri breeds. Average ejaculate

volume of semen in rams before and after treatment with oxytocin and prostaglandin has been presented in table 1. The values of ejaculate volume after oxytocin and prostaglandin administration in rams were compared and effect of both the treatments on ejaculate volume has been recorded. Semen volume recorded in this study in both the groups was equal and the findings were in accordance with the findings of George *et al.* (2003) in other breed of sheep. Houever. Bharti *et al.* (2009) stated that ejaculate volume in Chottanagpuri rams did not differ among the rams and slightly lower than the finding observed in this research. The findings obtained in this study after oxytocin administration were significantly ($p<0.01$) higher and in agreement with the findings of Bozkurt *et al* (2007) in rams. Nicholson *et al* (1999) has reported that the oxytocin significantly increases both the output of fluid and the number of spermatozoa by two fold in rams.

Results obtained in prostaglandin group were significantly ($p<0.01$) higher than the oxytocin treated group and their respective control. The finding was in accordance with the results of Mekonnen *et al* (1989) in rams, who observed increase in ejaculate volume after prostaglandin $F_{2\alpha}$ administration.

The mean values of seminal pH in rams before and after treatment with oxytocin and prostaglandin have been depicted in table 1. The pH observed in this study was in close consonance with the findings of George *et al* (2003). The findings in this study were not in accordance with the findings of Kakadiya *et al* (1995) who reported variation in pH between rams. This might be due to ionic concentration, buffering capacity of various components in seminal plasma and concentration of motile spermatozoa. Post treatment values of pH also did not vary from pre treatment values in the rams of both the groups (table 1). It is apparent from the table that there is no significant effect of either oxytocin or prostaglandin$F_{2\alpha}$ on seminal pH in rams in this study.

Mean values of mass activity of spermatozoa in semen before and after treatment with oxytocin and prostaglandin have been furnished in table 1. The values in both the groups were found to be similar and apparently did not differ among the rams. Bharti *et al* (2009) reported that mass activity in chottanagpuri rams did not differ among rams. The values obtained in this study were lower than the findings of Bharti *et al* (2009) in this breed and also in other breed as reported by George *et al* (2003). The result shows that there was significant increase ($p<0.01$) in mass activity in ram after oxytocin treatment. Bozkurt *et al* (2007) reported that exogenous administration of oxytocin in rams increases mass activity. There was no significant effect of prostaglandin $F_{2\alpha}$ on mass acivity of spermatozoa in the semen and results were in agreement with the findings of Rao *et al* (1986) in buffalo bulls and Dighe *et al* (1995) in bulls.

Mean values of sperm concentration per ml of neat semen samples in rams of oxytocin and prostaglandin groups have been depicted in table 1. The overall mean value of sperm concentration in the rams of oxytocin group was higher than the value obtained in prostaglandin group. The variation in sperm concentration might be due to variation in rams. Average sperm concentration per ml of neat semen in oxytocin group was almost similar to the findings of Bharti *et al* .(2009) in this breed. Average value of sperm concentration in rams of oxytocin group was also similar to the findings of George *et al.* (2003) in other breeds. The result shows significant ($p<0.01$) increase in sperm concentration in ram of oxytocin group. Whittington *et al* (2001) and Bozkurt *et al.* (2007) in rams, Dighe *et al* .(1995) in bulls and have reported significant increase in sperm concentration after oxytocin administration. In this study, there was significant ($p<0.01$) increase in sperm concentration in ram was also recorded after prostaglandin treatment. An increase in sperm concentration per ml with prostaglandin treatment has also been reported by Mekonnen *et al* (1989) in rams.

Mean values of live sperm percentage in neat semen of rams of oxytocin and prostaglandin groups before and after treatment have been shown in table 1. The overall mean values of live sperm percentage were almost equal in both the groups. Findings of this study were almost in accordance with the findings of Bharti *et al* (2009) in chottanagpuri rams. However, Masoumi *et al* (2008) reported that there was no effect of cloprostenol on live sperm percentage in bulls. The difference in the values of live spermatozoa percentage might be due to the effect of season (Obidi *et al.*, 2008), breed (Abid and Alkass, 1985), months and rams

(Saxena *et al.*, 1978). It is apparent that there was no significant difference between the effects of oxytocin and prostaglandin treatment on live sperm percentage.

Mean values of abnormal sperm percentage in both oxytocin and prostaglandin groups have been presented in table 1. The values observed in this study were almost in agreement with the findings of Bharti *et al* (2009) in chottanagpuri rams. It is evident from the results that out of total sperm abnormalities recorded in this study, tail abnormalities were highest, followed by head abnormalities and mid piece abnormalities in the rams of both the groups. The results obtained in this study were in agreement with the findings of Deka and Rao (1979) who also reported highest tail abnormalities in cross bred rams. Apparently sperm abnormalities percentage after treatment in both the groups was found to be lower than pre- treatment values but the difference was not found to be significant.

On comparison of values obtained after treatment in both the groups, significant change ($p<0.01$) in sperm head and sperm tail abnormality percentage were found in prostaglandin group as compared to oxytocin group.

It may be concluded that both oxytocin and prostaglandin administration increases ejaculate volume, mass activities and sperm concentration of semen significantly ($p<0.01$).

Table. EFFECT OF OXYTOCIN AND PROSTAGLANDIN F2α ON SEMINAL CHARACTERISTICS IN CHOTTANAGPURI RAMS

		Oxytocin	Prostaglandin F2α
Volume of Ejaculate	Pre Treatment	0.52± 0.02^{a}	o.56± 0.01^{a}
	Post Treatment	0.72± 0.02^{b}	0.83± 0.02^{c}
pH	Pre Treatment	6.50±0.01	6.50± 0.01
	Post Treatment	6.50± 0.01	6.49 ±0.05
Mass Activity	Pre Treatment	3.77±0.10^{a}	3.78± 0.07^{a}
	Post Treatment	3.99±0.05^{b}	3.85 ±0.06^{ab}
Sperm Concentration	Pre Treatment	3529± 8.86^{a}	3528± 3.44^{a}
	Post Treatment	3908±11.02^{b}	3891 ±6.02^{b}
Live Sperm percentage	Pre Treatment	81.94±0.71	82.33 ±1.00
	Post Treatment	82.86±0.53	83.73± 0.72
Percentage of Abnormal Spermatozoa	Pre Treatment	6.40± 0.59	6.40± 0.62
	Post Treatment	6.20 ±0.48	6.14±0.42
Percentage of Sperm Head Abnormality	Pre Treatment	0.85±0.12^{a}	0.86±0.12^{a}
	Post Treatment	0.76± 0.07^{b}	0.71 ±0.05^{b}
Percentage of Mid piece Abnormality	Pre Treatment	0.27± 0.08^{a}	0.26± 0.05^{a}
	Post Treatment	0.22± 0.07^{ab}	0.16±0.08^{b}
Percentage of Tail Abnormality	Pre Treatment	5.88± 0.27^{a}	5.87± 0.29^{a}
	Post Treatment	5.73± 0.30^{b}	5.71±0.23^{b}

Note: Mean values under the same superscript in a row did not differ significantly ($P < 0.01$)

ACKNOWLEDGEMENT

The authors are thankful to Dean, college of veterinary science and animal husbandry, Ranchi, Jharkhand for providing necessary facilities to conduct this study.

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