TESTICULAR DEVELOPMENT AND SEMINAL ATTRIBUTES OF AGONDA GOAN PIG

E.B. CHAKURKAR[1], S. NAYAKVADI[2], P.K. NAIK[3], A. MANDAL[4] AND M. KARUNAKARAN[5]*

ICAR - Central Coastal Agricultural Research Institute,
Ela, Old Goa, Goa - 403 402

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ABSTRACT

Out of thirty-six male Agonda Goan pigs (age, 30-270 d), six males were castrated at a time in a 30 d interval starting from 30 d to 180 d to study the biometry of testis and epididymis, whereas, six males were left uncastrated for semen studies. Testicular length, width, thickness, circumference, weight and epididymal weight were increased ($p<0.05$) from 30 to 180 d age. Motile sperms were found in cauda epididymis at 60 d age. Sperm cells harvested at 180 d showed maturity ($p<0.05$). The average volume of semen ejaculate (87.3±30 ml), sperm cell concentration ($136.8x10^6$ /ml) and mean total sperm cells per ejaculate (10.79×10^6) in Agonda Goan pigs were comparatively lower than reported values of exotic pigs, while testosterone level were higher than the exotic pigs at similar age.

Key words: Agonda Goan, Pig, Puberty, Seminal attributes, Testosterone

INTRODUCTION

Agonda Goan pig is the newly recognized pig breed of Goa state which is known for their adaptability to heavy rainfall, hot and humid conditions (Chakurkar *et al*., 2016). This breed is extensively used for crossbreeding with Large White Yorkshire and Duroc for better body weight gain but, at the same time retaining their meat quality, adaptability to local climate and system of rearing (Chakurkar, 2009). It was reported that boars of indigenous pigs attain puberty earlier than exotic pigs (Karunakaran *et al.,* 2008). No scientific documentation is available regarding the testicular development and semen characters of Agonda goan boars at different age. The present study revealed the testicular development and seminal attributes in Agonda Goan boars through testicular biometry, spermiogram and blood testosterone during different stages of growth.

MATERIALS AND METHODS

Thirty-six Agonda Goan male pigs (age, 30-270 d) were used in the study. Out of these, six male pigs were castrated at 30 d interval starting from 30 d to 180 d age and remaining six were left uncastrated for semen studies. The testicular weight, length, width, thickness and circumference were measured using Vernier caliper. The epididymis was separated from testis and weighed. Small incision was made on cauda epididymis and the epididymal fluids were aspirated with a needle and syringe (Kumaresan *et al.,* 2008). The samples were mixed with 1 ml BTS solution to screen for the presence of sperm cells under microscope. Sperm cell motility (total motility) was assessed at 400xmagnification under binocular microscope on a continuous scale of 0-100%. Percent live sperm cells were estimated using eosin-nigrosine stain (Karunakaran *et al.,* 2008 and Karunakaran *et al.,* 2016a). The morphological abnormalities of sperm cells were evaluated by Rose Bengal staining.

Semen ejaculates were collected by gloved hand technique over a period of four months. A total of 36 ejaculates were collected and the sperm rich fraction of ejaculates was used for the semen analysis. Semen attributes such as volume of the ejaculate, sperm cell concentration and total sperms per ejaculate were

[1]Principal Scientist, [2]Scientist; [3]Principal Scientist, ICAR-CARI, Regional Centre, Bhubaneswar; 4Principal Scientist, 5Senior Scientist, ICAR-NDRI-ERS, Kalyani, West Bengal; *drmkarunakaran@gmail.com

calculated. Sperm cell concentration and morphology were analyzed using Hamilton Throne CASA (IMV, India; Karunakaran *et al*., 2016b). Blood samples were collected from the saphenous vein at 30 d interval from 30 to 270 d of age. Blood testosterone was estimated using ELISA kit (Cheon *et al*., 2002). The data were analyzed statistically for test of significance by using WASP 2.0 software.

RESULTS AND DISCUSSION

During 30 to 180 d age, there was major development in the testis of Agonda Goan male pig as indicated by an increase ($p<0.05$) in the testicular parameters viz. testicular length, width, thickness, circumference, weight and epididymal weight (Table 1). In comparison, at 53 d age, the male piglets of indigenous Nagaland breed had testicular weight, length and breadth as 23.6±2.3 g, 4.9±0.7 cm and 3.9±0.3 cm, respectively, which at 85 d age increased to 32.9±4.6 g, 6.4±0.9 cm and 4.1±0.4 cm, respectively (Karunakaran *et al*., 2008). Furthermore, the testicular weight and circumference was higher in nondescript pigs of Mizoram, Meghalaya and Nagaland compared to Hampshire and Large White Yorkshire (Kumaresan *et al*., 2008).

In the cauda epididymis of Agonda Goan piglets at 30 d age, the sperm cells were absent, however, these were present in all the male pigs from 60 d age onward (Table 1). The percent motile sperms increased progressively with an increase in age, thus reaching >90% sperm motility at 180 d age ($p<0.05$, Table 1). In comparison, the cauda epididymis of indigenous pig of Nagaland at 60 and 90 d age had 15 and 85% motile sperm cell (Karunakaran *et al*., 2008). In addition, at the same age, the indigenous pigs of Mizoram and Meghalaya had 30.5±5.6 and 70.5±4.8% progressive motile sperm cells in the cauda epididymis (Kumaresan *et al*., 2008).

The live sperm cells in the cauda epididymal flushing of Agonda Goan pigs also increased from about 25 to 94% from 60 to 180 d age ($p<0.05$, Table 1). Similar pattern of live sperm cells in the cauda epididymis was recorded in in indigenous pigs of Nagaland, Meghalaya and Mizoram (Karunakaran *et al.,* 2008 and Kumaresan *et al*., 2008). A progressive decrease in the percent abnormal sperm cells was recorded between 30 to 180 d age of boars in the present study ($p<0.05$, Table 1), which was in accordance with abnormal pserm cells in the cauda epididymis of indigenous pig of Nagaland at 60 and 90 d age (Karunakaran *et al.,* 2008).

The mean volume of semen ejaculate in Agonda Goan pig collected by hand glove method was 87.30±30

Table 1: Testicular biometry as well as *In vitro* characteristics of sperm cells collected from cauda epididymis in different age groups of Agonda Goan pigs

Parameter	Age group					
	30 d	60 d	90 d	120 d	150 d	180 d
Testis length, cm	1.9±0.2^{a}	2.9±0.2^{b}	4.04±0.2^{c}	4.4±0.05^{c}	5.5±0.2^{d}	5.8±0.5^{d}
Testis width, cm	1.2±0.1^{a}	1.8±0.2^{b}	2.4±0.07^{c}	3.1±0.2^{d}	3.7±0.2^{e}	4.3±0.2^{e}
Testis thick., cm	1.1±0.1^{a}	1.2±0.2^{a}	1.83±0.1^{b}	2.4±0.13^{c}	2.9±0.3^{cd}	3.4±0.2^{d}
Testis circum, cm	3.8±0.5^{a}	5.8±0.4^{b}	7.5±0.4^{c}	8.5±0.31^{d}	11.0±1.1^{d}	14.9±0.9^{e}
Testis weight, gm	2.3±0.2^{a}	7.3±0.8^{b}	14.1±1.5^{c}	23.3±1.5^{d}	36.1±2.4^{e}	53.2±15.6^{e}
Epididym. weight, gm	0.8±0.2^{a}	1.7±0.2^{b}	3.6±0.2^{c}	7.1±0.3^{d}	9.6±0.8^{e}	14.3±2.6^{e}
Sperm motility, %	-	15.0±4.0^{a}	30.0±6.5^{b}	70.0±8.5^{c}	90±10.5^{d}	92.0±5.0^{d}
Live count, %	-	25.3±5.3^{a}	57.9±7.2^{b}	82.0±6.4^{c}	93.0±8.2^{d}	94.0±8.6^{d}
Total abnorm, %	-	28.6±3.9^{a}	22.3±1.6^{b}	17.9±2.3^{b}	9.8±0.8^{c}	5.5±0.7^{c}

$p<0.05$, Means in a row with different superscripts (a, b, c, d, e) differ significantly

ml in the present study, which was lower than average value for Large White Yorkshire boars (Chakurkar *et al.,* 2016). The average sperm cell concentration per milliliter of ejaculate and mean total sperm cells per ejaculate were $136.80x10^6$ and $10.79x10^6$ in the male pigs of present study, which was comparatively lower than values reported for exotic breeds (Chakurkar *et al*., 2016). This difference might be due to variation in the size of testis in these breeds. Furthermore, in the present study, the total sperm abnormalities in Agonda Goan pig wwere 16.38%, which is within the acceptable limit of <20%.

Reproductive hormones namely testosterone, estrogen and inhibin are produced by the testis and are essential for controlling GnRH, FSH and LH release pattern, thus ultimately regulating spermatogenesis and reproductive activity. In this study, an increase ($p<0.05$) in the blood testosterone was observed between 30 and 120 d age. In adult Duroc boars, testosterone level varied between 0.73 to 3.06 ng/ml during different seasons (Cheon *et al*., 2002), which is lower than the values of Agonda Goan pigs.

In brief, the present results revealed that the testicular growth was faster in Agonda Goan pig similar to indigenous pigs of Nagaland, Mizoram and Meghalaya, thus, suggesting an early onset of puberty.

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