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FLUCTUATION OF SERUM AND SEMINAL INHIBIN IN RELATION TO BULL FERTILITY

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SUMMARY

Blood and semen samples were collected for six successive months from 21 Friesian bulls. These bulls were used for natural service and were divided into three groups based on their semen characteristics. The first group consisted of bulls with high semen quality (10 bulls), the second group with moderates semen quality (6 bulls) and the last one with semen of low quality (5 bulls). Inhibin was measured in both serum and seminal plasma using indirect ELISA technique. Results showed that, bulls of group 1, had sperm cell concentration, motility%, live/ sperm% and fructolysis index higher than bulls of groups II and III, and lowest serum and seminal plasma inhibin potency. On the contrary, bulls of group 111, had the lowest semen characteristics with the highest serum and seminal plasma inhibin potency as compard with the two other groups. It is concluded that high inhibin potency in group 111 can be responsible for the production of semen of low quality.

INTRODUCTION

Inhibin are glycoprotein consisting of two dissimilar subunits, alpha and beta, joined by disulphide bonds (Ling et al., 1985., Mason et al., 1985 and Forage et al., 1987). In males ,this hormone was found to be mainly produced by the Sertoli cells and preferentially inhibits the production and /or secretin of gametogenic hormone (Baker et al., 1981., Burger and Igarashi, 1988 and Majumdar., 1977). Previous studies had detected the presence of inhibin in the serum and semen of a number of species without intervention with the effect of inhibin on semen characteristics (Keogh et al., 1976., Nandini et al., 1976., Steinberger & Steinberger, 1976 and Franchimont et al., 1978). The current study was devoted to evaluate levels of inhibin in the serum and seminal plasma of bulls in addition to correlate those levels with semen quality.

MATERIAL AND METHODS

Blood and semen samples were collected every week for six successive months from 21 Friesian bulls. These bulls were used for natural service in beni-Suef Governenate and have history of decreased conception rate among cows serviced by them. The bulls aged of 4-6 years and ranged in weight between 500-600kg. All bulls were under regular veterinary supervision. Semen was collected from these bulls using an artificial vagina according to walton technique (1945). As soon as semen was obtained, it was divided into three parts, the first was immediately used for evaluaion of semen characteristics (sperm density, mortality% and live%) as described by Salisbury et al. (1985). The second part was centrifuged at 3000 r.p.m. for 20 minutes to separate seminal plasma which was kept with its corresponding serum sample at 20°C till the assay of inhibin which was done using the indircet ELISA technqiue outlined by Ali (1998). The third part of semen was used to estimate initial fructose concontration as well as concentration after 1,2 and 3 hours of incubation at 37°C. Fructolysis index was calculated according to Mann (1948). Based on semen characteristics, bulls were divided into three groups; bulls of high semen quality (Group I, 10 bulls), moderate quality (Group II, 6 bulls) and low semen quality (Group III,5 bulls). Data were statisticaly analysed according to Snedecor (1971).

RESULTS

Data presented in Table (1) show that animals of group I had sperm cell concentration, motility%,

Table (1): Inhbin levels in serum and seminal plasma of bulls with different semen quality

Group	Sperm cell conc. (X10°)	Motility %	Live%	Seminal fructose concentration at zero time (mg%)	Fructolysis index (mg/10^9 spem/ hour at 37°C)	Serum inhibin	Seminal inhibin
I-Bulls with high se-	A	A	A	A	AB	ABI	AaI
men quality (10)	1.80±0.05	88.49±1.4	90.15±3.50	266.58±10.59	1.14±0.07	0.42±0.01	0.83±0.02
II-Bulls with moderate	A	A	A	B	Aa	AaII	BaI
semen quality (6)	0.89±0.04	60.80±1.12	71.90±2.15	250.05±15.06	0.71±0.04	0.65±0.04	1.09±0.07
III-Bulls with low se-	A	A	A	AB	Ba	BaIII	ABIII
men quality (5).	0.62±0.02	40.00±0.96	44.50±1.39	150.03±8.86	0.50±0.03	0.78±0.06	2.17±0.015

± : Standard error.
- Values within the same column having the same Capital letters are significantly different from each other at ($P<0.001$).
- Values within the same column having the same letters are significantly different from each other a ($P>0.05$).
- Comparison between serum and seminal inhibin values in the same row having the same lattin number are significantly differ at ($P>0.001$

live sperm% and fructolysis index higher than the corresponding data of groups II and III and lowest sperm and seminal plasma inhibin potency. On the contrary, bulls of group III had the lowest sperm cell concentration, motility%, live sperm% and fructolysis index with the highest serum and seminal plasma inhibin potency as compared with the other two groups.

DISCUSSION

Results of the present study showed that bulls with low semen quality possessed the highest serum and seminal inhibnin potency. It is known that inhibin is a gonadal hormone that suppresses the secretion and/or production of gametogenic hormone (GH) (Baker et al., 1981 and Burger and Igarashi., 1988). It is also, mentioned that the degree of GH inhibition depends on the time of exposure to inhibin and its dose (Steinberger et al., 1983). GH has an important role in regulation of of spermatogenesis and testis function (McDonals, 1980) particularly the differentiation and multiplication of spermatogonia and mitotic division of spermatocytes (Courot et al., 1979, Kilgoyr et al., 193 and Swanlund et al., 1995). It was also mentioned that GH is the key determinant of the rate of spermatogenesis (Waites et al., 1983 and Schambacher, 1988). So, it is clear that increased inhibin potency will decrease the rate of spermatogenesis through its effect on GH. This conclusion could be confirmed by the study of Tjondronegoro et al. (1996) who found that steroid free bovine follicular fluid given to rams reduced GH and impaired spermatogenesis. On the other hand, it was found that active immunization against inhibin elevated GH, increased testis size and daily sperm output and improved fertility of rams (Al-Obaidi et al., 1987 and McKeown et al., 1977) and the testicular sperm density in bulls (Martin et al., 1991 and Schanbacher., 1991). In addition to the systemic role of inhibin on GH, it was mentioned that inhibin suppressed spermatogonial development in a paracrine manner (Van-Dissel Emiliani et al., 1989 and Hakovitra et al., 1993). It was also reported that inhibin interfered with GH binding to its receptors in the testis (Vijayalakhmi et al. 1980) and inhibited the incorporation of labeled thymidine into testicular DNA both in vitro and in vivo (Franchimont et al., 1981 and Van-dissel-Emiliani et al., 1989). In addition to the aforementioned effects, it was recorded that inhibin suppresed the interstitial cell stimulating hormone (ICSH) Franchimont et al., 1979, Peak and Watkins , 1980 and Famworth et al., 1988). Reduced ICSH levels reduce testosterone secretion (McDonald, 1980). Also, inhibin has been shown to exert a paracrine effect on testosterone release from testis (Hsuch et al., 1986). As testosterone is needed for meiotic division and maintenance of spermiogenesis so, these processes will also be inhbited by increased inhibin potency. From the preceding finding, it could be concluded that the process of spermatogenesis is retarded by increased inhibin potency. Also, due to the probable inhibin induced reduction of ICSH, androgns impairment of epididymal functions could consequently takes place (Mann and Lutwakmann, 1981). It is known that the epididymis is the site of sperm maturation in which the sperm acquired the motility and capacity of fertilization (McDonals, 1980). Also,

it is worth mentioning that fructose is produced from the seminal vesicle under the control of androgens (Mann and Lutwak-mann, 1981). So, seminal fructose content is decreased in bulls with high inhibin potency. In addition, fructolysis is dcreased in this group so the energy produced through this process is reduced and this will interfere with the motility of the spermatozoa.

It is concluded that high inhibin potency in bulls of group III (group of low semen quality) could be responsible for the production of semen of low quality. Moreover, seminal inhibin level could be an important indicator for semen quality in bulls.

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