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Relationship Between Ovarian Inactivity and Genetic Polymorphism in Purebred Arabian Mares

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Abstract: The current study was carried out on 24 purebred Arabian mares to find out the possible association between genetic polymorphism of blood protein loci and fertility status. Serum protein electrophoresis was carried out using polyacrylamid gel. Gene frequencies of protein loci were estimated by Hardi - Weinberg formula. Also progesterone concentration was assayed by RIA. Results indicated that the most frequent alleles for fertile pregnant mares were Pr^{s}, Ptf^{N}, $F"_{2}{}^{A}$. and Gc^{F}, while mares with inactive ovaries were distinguished by the high frequency of Pr^{N} and $F"_{2}{}^{B}$ alleles Progesterone revealed significant high concentration in fertile as compared to infertile mares. In conclusion, fertility status is genetically controlled, so attention should be paid for selecting for breeding purposes according to such genetic markers.

Key words: Arabian mares % Ovarian inactivity % Genetic polymorphism % Progesterone

INTRODUCTION

In recent years, the availability of gene maps and genome scanning panels has led to the mapping of various to specific chromosomal regions or bands through tightly linked markers. An example of such a condition is the susceptibility locus of a hereditary. However, very little is known about genetic factors and their role in regulating fertility [1]. It was estimated that from fertilization until sexual maturation over one thousand genes spatiotemporally control the development of mammalian testes and ovaries, mutation in these genes can result in abnormal sexual development causing a range of reproductive abnormalities. Some studies recorded the occurrence of significant relationship between the origin of mares from definite breeding lines and their reproductive results [2]. Moreover, some relationships have been reported between fertility disorders and genetic constitutions in horses [3-7].

The main objective of the current investigation was to detect the possible association between ovarian activity and some blood protein genetic loci.

MATERIALS AND METHODS

Experimental Mares: The present study was carried out on 24 purebred Arabian mares kept at Al- Zahara stud, Ain shams, Cairo, Egypt. Mares, were divided into two equals groups, the 1st group included 12 pregnant (Fertile) mares, while the 2nd group included 12 mares suffering from ovarian inactivity (Infertile). Animal were housed in closed stables with open yard for exercises. Mares were fed on balanced ration, they have special care for diseases control, regular antiparasitic drugs against external and internal parasites and a daily training to improve it's general health condition.

Evaluation of Fertility: Evaluation of fertility was depending upon:

- Case history.
- Detection of estrus using teaser stallion to monitor the reflex of the mare to the stallion [8].
- Rectal examination of the mares was done to display the physiological or pathological conditions of the ovaries and tubular genitalia during the different stages of the reproductive cycle.

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- Progesterone level.

Blood Sampling: Blood samples were collected from jagular vein into clean dry sterile and heparinized vactuainer 0tubes from both groups.

Analyses:

- Assaying of progesterone level was carried out by commercial validated RIA kits [9, 10].
- Polyacrylamid gel electrophoresis (PAGE) was carried out [11] for genotyping of 5 blood protein loci (pre-albumin (Pr), transferrin (Tf), Posttransferrin (Ptf), " globulin ($F"_2$) and Gc-protein. Detection of gene frequency was carried out according to Hardi-Weinberg law [12].
- Statistical analysis of the collected data was done [13, 14].

RESULTS

Genotyping and Gene Frequencies of Fertile and Infertile Arabian Mares: Table 1 shows the genotyping of 5 blood protein loci and the gene frequencies of these loci in both fertile and infertile mares. Results showed that all studied loci were polymorphic and the fertile pregnant mares are characterized by high frequency of the pr^s (0.73), Ptf^N (0.83), $F"_2{}^A$ (0.71) and Gc^F (0.71) alleles, while mares with inactive ovaries are distinguished by high frequent of Pr^N $F"_2{}^B$ (0.64) alleles.

Progesterone Level: Progesterone level averaged 5.11±0.94 (ng/ml) in fertile mares Vs. 0.35±0.73 ng/ml in mares with inactive ovaries (Fig. 1).

DISCUSSION

The most commonly encountered chromosomal abnormality in horse is XO gonadal dysgenesis, was first described during 1975. Mares with this disease lack the pair of sex chromosomes resulting in a 63, X Karyotype, the mare is presented as an infertile female, usually smaller in size for age and breed with small inactive ovaries, the second most common finding in infertile mares with inactive gonads, is the karyotype of a male horse (64, XX, XY) gonadal dysgenesis, XY sex reversal, testicular feminization [3].

Molecular cytogenetic and genetics have increased our understanding about the association of abnormal chromosome constitutions and disorders of sex development in farm animals has been detected. Additionally, other genes which appeared to be involved in ovary differentiation have been found [5].

The main goal of present study was to characterize the possible relationship between polymorphic blood protein loci (as a genetic markers) and ovarian activity of purebred Arabian mares. However, the genetic relationship between blood protein loci and reproduction has been reported [15-18].

In the present study, fertile mare showed high frequency of Pr^S, Ptf^N, $F"_2{}^A$ and Gc^F alleles, these finding

Table 1: Genotying and gene Frequencies of blood Protein loci for fertile and infertile mares

		Gene Frequencies	
Blood protein loci	Genotyping	Fertile pregnant mares (N= 12)	Mares with inactive ovariesy (N=12)
Prealbumin (Pr)	NN	Pr^N= 0.27	Pr^N = 0.71
	NS	Pr^S=0.73	Pr^S = 0.29
	SS		
Transferrin (Tf)	DD	Tf^D = 0.23	Tf^D= 0.5
	DO	Tf^O = 0.67	Tf^O = 0.5
	OO		
Post-transferrin (Ptf)	RR	Ptf^R =0.87	Ptf^R= 0.57
	RN	Ptf^N = 0.83	Ptf^N = 0.43
	NN		
"-globulin $F"_2$	AA	$F"_2{}^A$ = 0.71	$F"_2{}^A$ = 0.36
	AB	$F"_2{}^B$= 0.29	$F"_2{}^B$ = 0.46
	BB		
Gc-Protein	FF	Gc^F = 0.71	Gc^F = 0.43
	FS	Gc^S= 0.29	Gc^S = 0.57
	SS		

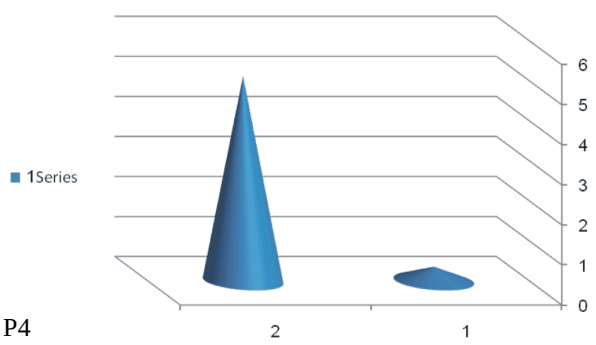

Fig. 1: Plasma progesterone profile (ng/ ml) in fertile(2) and infertile(1) purebred arabian mares (M+SE)

especially for F"$_2^A$ and Ptf^N are in agree with those previously reported [19]. Zaabal *et al.* [20] found a positive correlation between Tf^D and Gc^F genetic marker with fertility in purebred Arabain stallion and this result is in line with the finding of present study. Mares with inactive ovaries have been characterized with the high frequency of Pr^N and F"$_2^B$ which may lead to the probability of polygenic effect of these gene markers in ovulation in mares [21], it is of interest to notice that pre albumin (Pr) locus in the present study has two autosomal alleles Pr^N and Pr^S one of them high frequent in case of fertile (Pr^S - 0.37) while other allele (Pr^N = 0.71) high frequent in infertile mares and the condition may attributed to the association between genetic constitution and physiological function as the only function of Pr is thyroxin binding and transport [22].

The lowest plasma progesterone profile in the present study was observed for the anestrous mare (0.35 ng/ m1) as compared with the fertile group (5.11 ng/ml) confirmed the state of ovarian inactivity in this group, whereas most of progesterone is secreted from corpora lutea in the ovary. This finding is similar to that previously reported [23, 24].

It could be concluded that fertility status is genetically controlled, so attention should be paid for selecting for breeding purposes according to such genetic markers.

REFERENCES

1. Cederroh, C.R., J.L. Pitetti, M.D. Papaioannou and S. Nef, 2007. Genetic Programs that regulate testicular and ovarian development. Mol. Cell, Endocrinol., 265-266: 3-9.
2. Budzynski, M., J. Kamieniak, M. Budzyska, M. Sepula, Z. Slomka and L. Soityts, 2000. Estimation of the relations between reproduction indexes and inbred of full English Blood mares at the horse stud at Rzeczma. Annales universtatis curiesk lodouska sectio EE Zootechnical., 18: 133-139.
3. Bowling, A.T., L. Milon and J.P. Hughes, 1987. Update of chromosomal abnormalities in mares. J. Reprod. Fertility Suppl., 35: 149-155.
4. Bhanup, C.H., P. Nadina and R. Terje, 2008. Potential applications of equine genomics in dissecting diseases and fertility. Anim. Reprod. Sci., 107: 208-218.
5. Villagomez, A.D.F., D. Parma, O. Radi, G. Di Meo, A. Pinton, L. Lannuzzi and W.A. King, 2009. Classical and molecular cytogenetic of disorder of sex development in Domestic Animals. Cytogenetic And Genome Research, 126(1-2): 110-131.
6. Cortes, O., I.Y.S. Tupac, Upangua, Dunner, J. Fernandez and J. Canon, 2011. Y chromosome genetic diversity in the Lidia bovine breed: A highly fragmented population. J. Animmal Breeding and Genetics, 128(6): 491-496.
7. Person, L.D., M. Kargo, P. Perg, T. Jveorgard, L.H. Buch and A.C. Sorenson, 2012. Genetic Selection Strategies in dairy cattle breeding programmes: sexed semen cannot replace multiple ovulation and embryo transfer as superior reproductive technology. J. Animal Breeding and Genetics, 129(2): 152-162.
8. Ginther, O.J., 1990. Folliculogenesis during the transitional period and early ovulatory season in mares. J. Reprod Fertile Suppl., 90: 311.
9. Kubasik, N.P., 1984. Evaluation of direct solid phase. RIA for Progesterone. Clin Chem., 30: 284.
10. Metzger, D.A., 1992. Sex Sterid effects on the endometrium infert Reproduct. Med. Clin. North Amer., 3: 163.
11. Carlstrom, A. and B.G. Johnson, 1983. Electrophoresis Immun Fixation Scand J. Immunology, 17: 23-30.
12. Mashorov, A.M., 1980. Genetic Markers of animal Selection. ed "Hakya", Moscow, pp: 315.
13. Spigal, M.R., 1987. Theory and Problems of Probability and Statistics SI (Metric) Edition Schaumis outline series Mc Grow - Hill Book Company.
14. Spigol, M.R., 1988. Statistical Methods. Low State University Press, pp: 59.

15. Barker, J.S.F., S.G. Tan, O.S. Selvarj and T.K. Mukherjee, 1997. Genetic variation within and relations among populations of Asian water buffalo (*Bubalus bubalus*). J. Animal Genetics, 28: 1-13.
16. Kantanon, J., T. Olsakar, S. Adalsteinsson, K. Sandberg, Eythore, E. Dottir, K. Pirhonen and E. Holnlm, 1999. Temperal changes in genetic variation of North European cattle breed, J. Animal Genetics, 30: 16-27.
17. Zaabal, M.M. and W.M. Ahmed, 2008. Monitoring of some Reproductive parameters in local Egyptian Friesian cows with emphasis on the use of immunogenetic Analysis for evaluation of fertility. Global J. Molecular Sciences, 3(1): 1-6.
18. Bijma, P., 2012. Long - term Genomic improvement new challenges for population genetics. J. Animal Breeding and Genetics, 129(1): 1-2.
19. Ahmed, W.M. and M.M. Zaabal, 2009. Analyzing the immunogenetic constituents of Dams, sires and calves Relation to placental Retention in a Friesian herd J. Global Veterinaria, 3(1): 32-36.
20. Zaabal, M.M. and W.M. Ahmed, 2010. Correlation between semen characteristics and some gene markers in purebred Arabian stallions J. Reprod and Fertility, 1(2): 45-49.
21. Alexander, S.L. and G.H.G. Ivrine, 1986. Effect of graded doses of gonadotropin releasing hormone on serum LH concentration in mares in various reproductive states: Comparison with endogenously generated pulses. J. Endocrinol., 110: 19.
22. Kenko, J. Jerry, 1997. Clinical Biochemistry of Domestic Animals 5th ed., Academic Press USA, pp: 117-617.
23. Townson, D.H., R.A. Pirson and O.J. Ginther, 1989. Characterization of plasma progesterone concentrations for two distinct luteal morphologies in mares Theriogenology, 32: 197.
24. Agag, M.A., M.T. Nasr and M.A. Abdel El Razike, 1996. Diagnosis of reproductive status in Arabian mares using ultrasound. Benha Vet. Med. J., 7(1): 108.