Ankara Üniv Vet Fak Derg, **57**, 135-137, 2010

Short Communication / *Kısa Bilimsel Çalışma*

In vitro evaluation of principle spermatological parameters in different rabbit breeds

Ongun UYSAL[1], Çiğdem ÇEBİ[1] , Ömer VARIŞLI[1], Mehmet Borga TIRPAN[1], Derya DİNÇEL[1]

[1] Ankara University Faculty of Veterinary Medicine, Department of Reproduction and Artificial Insemination, Ankara, Türkiye.

Summary: Semen was collected by artificial vagina using a doe as a dummy from 2 Californian, 2 New Zealand White (NZW) and 2 Blue Viena (BV), a total of 6 mature bucks throughout the study. Principle spermatological parameters were evaluated in fresh semen. In this study, no significant differences among individuals and breeds were determined for morphologic sperm abnormalities and sexual behavior ($p>0.05$). But, differences among individuals and breeds for ejaculate volume ($p<0.01$), sperm motility ($p<0.001$), sperm concentration ($p<0.001$), dead sperm ($p<0.001$), sperm viability ($p<0.001$), and sperm pH ($p<0.05$) were found significant.

Key words: Blue Viena rabbit, Californian rabbit, New Zealand White rabbit, semen evaluation, spermatological parameters.

Farklı tavşan ırklarında başlıca spermatolojik parametrelerin *in vitro* değerlendirilmesi

Özet: Çalışma süresince, 2 Kaliforniya, 2 Yeni Zelanda Beyazı ve 2 Mavi Viyana ırkı toplam 6 erişkin erkekten bir fantom kullanılarak sun'i vajenle sperma alındı. Nativ spermalarda başlıca spermatolojik parametreler değerlendirildi. Bu çalışmada, bireyler ve ırklar arasında morfolojik spermatozoa anomalileri ve seksüel davranış yönüyle hiçbir farklılık saptanmadı ($p>0.05$). Fakat, ejakülat miktarı ($p<0.01$), spermatozoa motilitesi ($p<0.001$), spermatozoa yoğunluğu ($p<0.001$), ölü spermatozoa oranı ($p<0.001$), spermatozoa canlılığı ($p<0.001$) ve sperma pH'sı ($p<0.05$) yönüyle bireyler ve ırklar arasındaki farklılıklar istatistik açıdan önemli bulundu.

Anahtar sözcükler: Kaliforniya tavşanı, Mavi Viyana tavşanı, Yeni Zelanda Beyazı tavşanı, spermanın değerlendirilmesi, spermatolojik parametreler.

Semen production and quality depends on a great variety of management, environmental and genetic factors (1): breed, age, sexual preparation, season of collection, number of ejaculates collected and interval between collections. It is important to know the variability of the spermatological parameters to determine between individuals and breeds. Therefore it has great importance to estimate the variability and repeatability of several semen quality characteristics, some of which were qualitative traits of the sperm cells (2). Sexual behavior is also very complex, both in the male and female genders. In males, testosterone is one of the hormones that modulate sexual behavior includes libido sexualis (mating desire), sexual drive and mating ability (3). Sexual drive is considered as the drive and willingness of the male to search for a female and accept her for the purpose of mating (7).

This study was carried out to display principle spermatological parameters of different rabbit breeds and in order to compare the differences in sexual behaviour and semen quantity and quality between different rabbit breeds and individuals.

Sperms were collected by artificial vagina, in the morning twice a week, using a doe as a dummy from 2 Californian, 2 NZW, and 2 BV, a total of 6 mature rabbits throughout the study. Ten ejaculates were collected from each rabbits (2 Californian, 2 NZW, and 2 BV) and a total of 60 ejaculates were assessed in this study. Immediately after collection sperms were kept in water bath at 37° C until evaluation. Spermatologically volume, motility, concentration, morphologic abnormalities, dead sperm, viability with fluorescent stain (6), pH and sexual behaviour (3) were evaluated.

The sperm evaluations were repeated 10 times and the results were expressed as the mean ± S.E.M. Means were analyzed by analysis of variance (ANOVA), followed by the Kruskal Wallis test to determine significant differences between the 6 experimental

Table 1: Mean (±SEM) of principle spermatological parameters in fresh rabbit semen and sexual behavior (n: 10).

BUCKS	Ejaculat volume (ml)	Sperm motility (%)	Sperm concentration ($X10^6$/ml)	Morphologic sperm abnormalities (%)	Percentage of dead sperm (%)	Sperm viability (%)	Sperm pH	Sexual behavior
CALIFORNIAN (1)	0.86±0.46 a	44.00±5.68 a	150.50±104.85 a	16.90±7.58	27.10±10.03 a	56.30±8.94 b	7.95±0.28 a	4.90±0.32
CALIFORNIAN (2)	0.61±0,28 b	35.50±8.96 b	137.05±42.38 a	20.40±7.04	52.10±11.82 b	38.40±8.64 a	7.65±0.24 b	4.60±0.52
Average	0.73±0.4	39.75±7.32	143.85±73.61	18.65±7.31	39.60±11.02	47.35±8.80	7.80±0.30	4.75±0.42
NEW ZEALAND WHITE (1)	0.40±0.20 b	65.00±7.07 cd	173.75±171.02 a	20.00±18.85	26.70±14.77 a	72.70±10.47 d	7.80±0.26 ab	4.80±0.42
NEW ZEALAND WHITE (2)	0.36±0.11 b	59.50±8.64 c	282.50±169.63 a	20.20±4.49	37.30±8.49 c	63.30±9.63 bc	7.70±0.26 b	4.70±0.48
Average	0.38±0.15	62.25±7.85	228.12±170.32	20.10±11.70	32.00±11.63	68.00±10.05	7.75±0.26	4.75±0.45
BLUE VIENA (1)	0.60±0.27 b	74.00±8.76 e	448.75±194.05 b	16.50±13.26	19.60±8.72 a	76.40±10.22 d	7.60±0.21 b	5.00±0.01
BLUE VIENA (2)	0.55±0.14 b	69.50±10.92 de	514.00±159.41 b	20.20±18.04	20.20±8.80 a	68.60±11.20 cd	7.65±0.24 b	4.80±0.42
Average	0.60±0.20 **	71.75±9.84 ***	481.40±176.73 ***	18.35±15.65 -	19.90±8.80 ***	72.5±10.71 ***	7.62±0.22 *	4.90±0.21 -

[a, b, c, d, e :] Different superscripts at same columns denote significant differences

(***: p<0.001, **: p<0.01, *: p<0.05, -: p>0.05).

groups using the SPSS/PC version 12.0 software (SPSS, Chicago). Differences with values of $p<0.05$ were considered as significant (4).

Ejaculate volume varies according to collection method and frequency of semen collection. But generally, the ejaculate volume ranges from 0.1 to 3.0 ml in mature rabbits (5). In present study, average ejaculate volume was observed in normal values expected for different breeds and individuals. It is known that only progressively motil sperm cells have fertilising ability. The highest sperm motility (71.75±9.84 %) was found for BV rabbits in this study. Sperm concentration can change depending on age, season, breed, skill of technician, frequency of semen collection or time and individuals factors. Average sperm concentration of BV semen (481.40±176.73 $X10^6$/ml) obtained from in this study was in the normal limits, but, this value was significantly higher than that of recorded in fresh semen of other rabbit breeds (143.85±73.61 and 228.12±170.32 $X10^6$/ml). Every semen sample contains abnormal sperm cells. When abnormal sperm cells exceed 20 %, fertility typically declines (2). Acrosomal deformations also have not to exceed 5 % (8). The morphological sperm abnormalities (20.00±0.52 %) did not reach to values which effect fertility for each breed and individuals in this study . Rabbit semen of good quality should not to possess more than 25 % of dead sperm absolutely (2). If the percentage of dead sperm exceed 25 %, fertility decrease dramatically. The percentages of dead sperm for Californian (39.60±11.02 %) and NZW (32.00±11.63 %) in this study were found close to each other, but the results obtained from both breeds were determined higher than those of BV (19.90±8.80 %). Sperm viability determined with fluorescent stain was recorded as the lowest value (47.35±8.80 %) in Californian rabbit semen, but the same parameters for NZW (68.00±10.05 %) and BW (72.5±10.71 %) were found higher than that of Californian respectively. Sperm viability values exhibited paralellism with sperm motility in this study. Semen pH can change with confusing with urine, hair, dirt, pus and other contaminants (5). It was observed that average pH values for Californian, NZW and BW (7.80±0.30, 7.75±0.26, 7.62±0.22) were obtained from this study. Sexual behavior which is the first prediction about fertility reflects that if an animal is sufficient for breeding (5). In our study, sexual behavior was scored closed to maximum value for Californian (4.75±0.42), NZW (4.75±0.45) and BV (4.90±0.21).

Principle spermatological parameters were displayed in three different rabbit breeds and compared each other for sexual behaviour and semen quantity and quality. As shown in Table 1, no significance differences among individuals and breeds were determined for morphological sperm abnormalities and sexual behavior of bucks ($p>0.05$). But, differences among individuals and breeds were found significant for ejaculate volume ($p<0.01$), sperm motility ($p<0.001$), sperm concentration ($p<0.001$), percentage of dead sperm ($p<0.001$), sperm viability ($p<0.001$) and semen pH ($p<0.05$) statistically.

In conclusion, according to the results of this study, it was observed that principle spermatological parameters determined in the semen of different rabbits breeds are

within nearly normal limits and rabbits have significant individual differences when they were evaluated for sperm parameters but, it was considered that semen of BV possess high quality in this study.

References

1- **Alvarino JMR** (2000): *Reproductive performance of male rabbit.* In: Proceedings of the Seventh World Rabbit Congress, vol. A, Valencia, Spain, pp. 13–35.

2- **Ax RL, Dally M, Didion BA, Lenz RW, Love CC, Varner DD, Hafez B, Bellin ME** (2000): *Semen evaluation*. In: Reproduction in Farm Animals. Ed. B. Hafez and E.S.E. Hafez, chapter **25**, 365-375.

3- **Crews D** (1993): *Diversity hormone-behavior relation in reproductive behavior*. In: Beckerrr, J.B., Breedlove, S.M., Crews, D.A. (Eds.) Behavior Endocrinology. The Bradford Book. MIT Press, Cambridge, MA, USA. (Chapter 5).

4- **Daniel WW** (1991): *Analysis of variance*. 274-320. In: WW Daniel (Ed), Biostatistic: A Foundation for Analysis in the Health Sciences. John Wiley& Sons, Hoboken.

5- **Demirci E** (1994): *Andrological examination*. In: Reproduction, Artificial Insemination, Gyneacology and Infertility in Livestock. Ed: E. Alaçam, Dizgievi, Konya.

6- **Garner DL**, **Johnson LA**, **Yue ST**, **Roth BL**, **Haugland RP** (1994): *Dual DNA staining assessment of bovine sperm viability using SYBR-14 and propidium iodide.* J Androl, **15**: 620-629.

7- **Kelley DB, Brenowits E** (1993): *Hormonal influences on courtship behavior*. In: Becker, B., Breedlove, S.M., Crews, D.A. (Eds.), Behavior Endocrinology. The Bradford Book. MIT Press, Cambridge, MA (Chapter 7).

8- **Saacke RG, White JM** (1972): *Semen quality test and their relationship to fertility.* Proc Fourth Techn Conf Anim Reprod Artif Insem Nat Assoc Anim Breed, Chicago.

Geliş tarihi: 10.06.2008 / Kabul tarihi: 03.03.2009

Address for correspondance:
Assoc. Prof. Dr. Ongun Uysal
Ankara University, Faculty of Veterinary Medicine,
Department of Reproduction and Artificial Insemination,
06110, Dışkapı, Ankara, Türkiye.
Tel: 312 317 03 15/406
e-mail: onuysal@veterinary.ankara.edu.tr.