

The Postnatal Development of the Ouled Djellel Ram Testis of Semi-Arid Zones

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ABSTRACT

The objective of this study is to study the seasonal variations of the post-natal development of the testis of Ouled Djellel lambs born in semi-arid zones. The study was conducted on lambs born in October at the pilot farm Bouali Hamdene, located 15 km from Sigus, wilaya Oum El Bouaghi. The testes with the epididymis were dissected from the genitalia of rams born in October at the age of 0 (<24 hours), 4, 12, 20, and 32 weeks. The testes with the epididymis were weighed, measured, and placed in the aqueous Bouin fixative and prepared for histological study. The histological development of different testicular structures during the postnatal period was elucidated. Testicular growth between 0 and 32 weeks of age was associated with remarkable changes in testicular histology including increased tubular tissue volume, tubular diameter and length, and spermatozoa. It has been deduced that these lambs have reached puberty between the ages of 5 and 6 months (between March and April) and that the season and the change in temperature may have an effect on the age of puberty. It is concluded that the histological development of the testis, especially the seminiferous tubules of the Ouled Djellel lambs during the postnatal period, is necessary to acquire reproductive capacities to reach the age of sexual maturity. This age is influenced by several seasonal and physiological factors.

Keywords: Postnatal Development, Testis, Puberty, Ouled Djellel, Semi-Arid.

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1. INTRODUCTION

In Algeria, the sheep herd is the largest animal resource in the country (Chellig, 1992), sheep farming is concentrated in the most favorable steppe. The Ouled Djellel (OD) breed is the most dominant in this region, accounting for nearly 60% of the total 19.6 million head (Madani et al., 2009). The steppe climate is characterized by cold winters and hot, dry summers. The steppe ecosystem is characterized by a great variability of rainfall. For this reason, the most important constraint is the increase in productivity in these bad weather conditions which is a major concern for sheep farmers (Madani et al., 2009).

The postnatal period, which extends from birth to the period of puberty, is one of the most important stages of life that will allow the ram to acquire reproductive abilities, and that the breed, seasonal feeding and variation may affect this period (Evans et al., 1987, Bonnes et al., 1988, Brice et al., 1995, Gordon, 1997). However, to control and to improve the breeding of the Ouled Djellel breed, we must not only understand the changes and mechanisms that control the development of the Ouled Djellel ram testis during this period, but also understand the impact of environmental factors during this critical period. (Salhab et al., 2001) have shown that a remarkable increase in tubular tissue and significant testicular growth of Blackbelly's rams is due to the significant increase in the concentration of testosterone as a consequence of the increase of testicular response to LH. The increase in testosterone leads to the formation of mature spermatozoa (Malpoux, 2001). In addition, the increase in LH concentration indicates that a change in sensitivity of the hypothalamic-

pituitary-testicular axis occurs at that time leading to pubertal age (Malpoux, 2001).

Since there are no studies on the post-natal development of the ram's genitalia Ouled Djellel and its relation with seasonal variations, the main objective of this research is to contribute to the study of seasonal variations of the development post-natal testicle of Ouled Djellel lambs born in October in Oum El Bouaghi which is known for its semi-arid climate.

2. MATERIAL AND METHODS:

This research is carried out in the pilot farm Bouali Hamdene, located 15 km from Sigus, wilaya Oum El Bouaghi (elevation 700m, latitude 35 ° North and longitude 7 ° East) The climate of the region is semi-arid with mean annual temperature of 13 ° C (minimum and maximum temperatures of 1.8 ° C and 34.5 ° C, respectively). Quinze Ouled Djellel lambs born in October 2014, were chosen for the experiment. The lambs were raised in the flock and subjected to natural photoperiod. In addition to breast milk, they had good hay and maize concentrate available.

After slaughter, the testicles were dissected from the genitalia removed from Ouled Djellel rams born at the beginning of October at the age of 0 (<24 hours), 4, 12, 20, and 32 weeks. Small fragments from each sample were fixed in 70 °, 95 °, and 100 ° ethanol, dehydrated in a graded series of ethanol, and clarified in xylene and embedded in paraffin. Tissue blocks were cut at 4 µm thickness, and sections were de-waxed and stained with Haematoxylin-Eosin (H & E) technique for general histology studies.

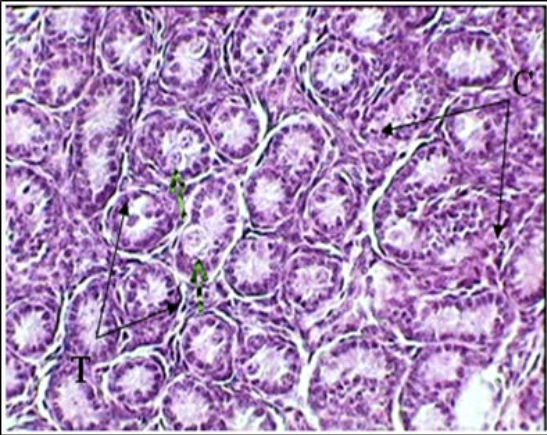


Figure 1: Microphotography shows a cross-section of the testicle of the lamb Ouled Djalal at birth (October, month). The seminiferous tubules (T), conjunctiva-vascular tissue (C), spermatogonia migrate to the periphery (arrows), seminiferous tube lumen (L), X 400. Seminiferous tubules (3); Tunica albuginea (1); The peritubular sheath (2), x100.

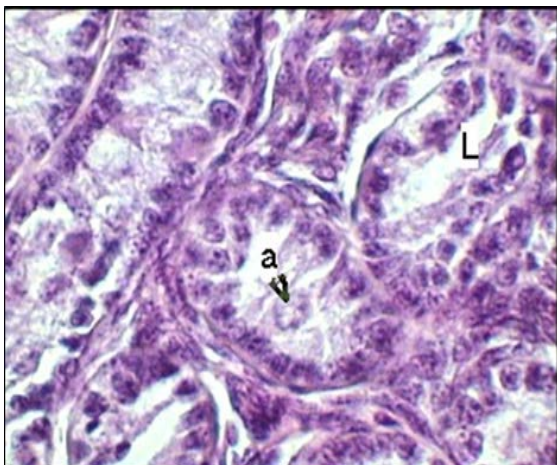


Figure 2: Microphotography represents part of the testicle of the lamb Ouled Djalal at birth (October). Seminiferous tubules (a); spermatogonia located in the center of the tube (a); the cavity of the seminiferous tube (L); Sertoli cells (arrows). x1000.

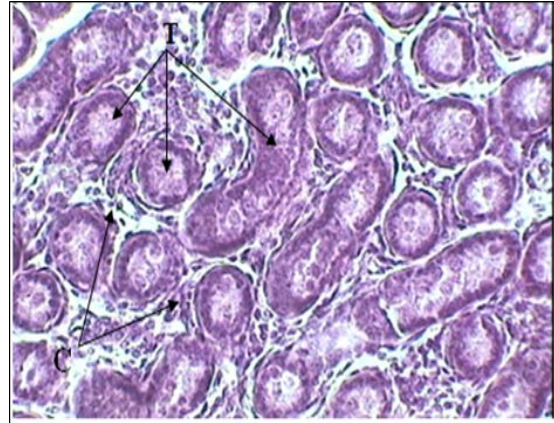


Figure 3: Microphotography represents part of the testicle of lamb Ouled Djalal at 4 weeks of age (November month). Seminiferous tubules (T); Conjunctivo-vascular tissue (C) x400.



Figure 4: Microphotography represents part of the testicle of the lamb Ouled Djalal at 12 weeks of age (January). Seminiferous tubules (T); Conjunctivo-vascular tissue (C) x100.

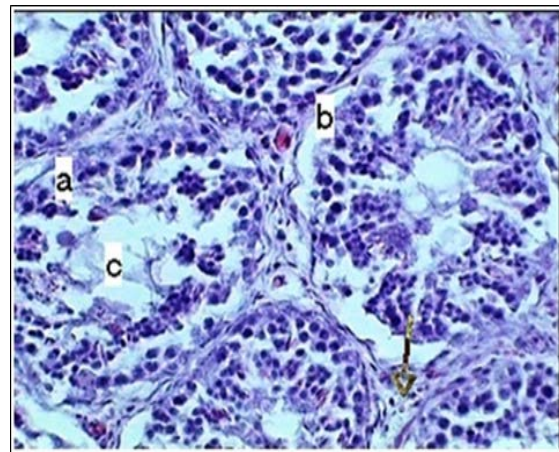


Figure 5: Microphotography represents part of the testicle of the lamb Ouled Djalal at 20 weeks of age (March). Spermatogonia (a); Tube light (c); blood capillaries (b); leydig cells (Arrow), various advanced stages of spermatogenesis are observed, x400

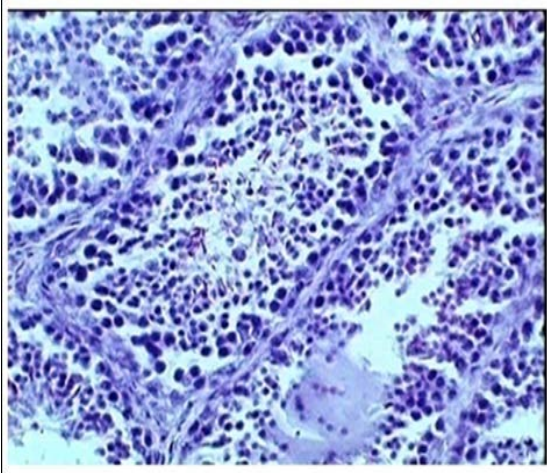


Figure 6: A section of the testis of the lamb Ouled Djatal at 32 weeks of age (May), the spermatozoa (sp) are scattered in the tubule lumen (L), 400X.

3. DISCUSSION:

The testes of lambs and rams are composed of seminiferous tubules as in all mammals. Each testicular lobule contains 2 to 4 seminiferous tubules (Charles, 1991) Hugo et al., 1975, Wheeler et al., 1985), epithelium, spermatogenic cells, and sertoli cells. It is well known that just before the sexual differentiation of the embryo, the primordial germ cells migrate into the fetal testis and then differentiate into gonocytes that are located in the seminiferous tubules. They multiply and, shortly after birth, become spermatogonia that remain dormant until puberty where they become spermatozoa (Baril et al., 1993).

Testicular growth between 10 and 32 weeks of age was associated with remarkable changes in testicular histology, which included increases in tubular tissue volume, tubule diameter and length. The presence of sertoli cells at birth and at 12 weeks of age is in agreement with the results of other breeds, such as Ile-de-France (Hochereau, 1987). Tubular tissue increased due to proliferation of Sertoli and germ cells. During the first weeks after birth, gonocytes and spermatogonia (Wrobel, 2000) remained close to the basement membrane and none of the advanced germ cells were present. The lengthening of the tubules occurring during this period results largely from the mitotic activity of spermatogonia and Sertoli cells (Franc et al., 2000). While, the presence of spermatozoa at the age of 8 months in the seminiferous tubes indicating the different advanced stages of spermatogenesis at the age observed at 5 months of age. The process of spermatogenesis is completed for 49 days in adult ram (Good et al., 2005). The young ram is generally able to fertilize females at about 6 months of age, but this average varies considerably depending on the size of the body, individual, race, diet, and the season of birth (Evans et al., 1987, Bonnes et al., 1988, Brice et al., 1995, Gordon, 1997).

An average ejaculate of 1 ml contains approximately 3 to 4 billion spermatozoa. If external agents (nutritional deficiency, disease, stress, etc.) cause an interruption in the sperm production cycle, normal ram fertility will not be restored until

a complete cycle of sperm production is complete (Evans et al. 1987, Bonnes et al., 1988, Brice et al., 1995, Gordon, 1997). So, a significant increase in the concentration of testosterone as a consequence of the increase of testicular response to LH, testosterone is known by its effect on advanced stages of spermatogenesis, it is in the completion of meiosis and the initiation and maintenance of all phases of spermatogenesis (Courrot et al., 1981). The rapid increase in mean LH concentration (6 weeks old) has been reported previously for other breeds (Lee et al., 1976, E chternkamp 1984, Silvana et al. the frequency of LH pulses (Lee et al., 1976), the increase in LH concentration indicates that a change in hypothalamic-pituitary-testicular axis sensitivity occurs at this time, representing perhaps the time of initiation of the pubertal process (Lee et al., 1976) between the age of 5 and 6 months (March-April).

As regards the effect of seasonality on the development of the testis of Ouled Djatal lambs born in the month of October, it can be deduced that lambs reached puberty between the age of 5 and 6 months between the month of March and April. The transition from winter to spring can have an effect on the onset of puberty (Good et al., 1988).

As Oum El Bouaghi's meteorological data indicate, there is an increase in temperature when comparing the months of March and April with the month of March.

February. For the effect of photoperiod and melatonin, it can be deduced that the transition from short days to long days also has an effect on puberty (Cameron, 2006). It is well known that melatonin is a hormone that controls the onset or cessation of sexual activity. In addition, we do not forget the other factors that can also have an effect on the age of puberty such as race, nutrition, etc.

Further studies are needed to better elucidate the ecological effect on the development and puberty of the Ouled Djellel lambs raised in Oum El Bouaghi.

4. CONCLUSION

The histological development of the testis, especially the seminiferous tubules, during the postnatal period is necessary to acquire reproductive capacities to reach the age of puberty and sexual maturity. This age is influenced by several seasonal and physiological factors. This study opens other research perspectives.

REFERENCES

1. Baril, P., Chemineau, Y., Cognie, Y., Guerin, B., Leboeuf, P., Oreur, P., Vallet, JC, 1993. Training manual for artificial insemination in sheep and goats. goats.
2. Bonnes, G., Strack, F., Leonard, L., 1988. Facilitating condition of the human Smile: A Nonobtrusive Test of the Facial Feedback Hypothesis. *Journal of Personality and Social Psychology*, 768-775.
3. Brice, G., C., Jardon, A, Vallet, 1995. Update on the behavior of reproduction in sheep. Eds, Institute of Livestock, Paris, France, 79pp.
4. Cameron, J., 2008. Photoperiod Reference Guide Technical Publications. Laval University, Faculty of Agricultural and Food Sciences, Canada, 138pp.

5. Charles.S., 1991. *Journal of Animal Ecology*61:499-502
6. Chelling, 1992. *Sex and biology in Kantnstitute for Philosophy, University of Paderbon, Bayernring9, Berlin.*
7. Courot, M., Ortavant, R., 1981. *Endocrine control of spermatogenesis in the ram. J. Reprod Fertil.* 30, 47-60.
8. Evans, G., Maxwell, W. M. C., 1987. *Salamon's Artificial Insemination of Sheep and Goats. Eds. Butterworth. Sydney, Australia, 200pp.*
9. Franca, L.R., Silva, J.V., Chiarini-Garcia, H., Garcia, S.K., Debeljuk, L., 2000. *Cell proliferation and hormonal changes during postnatal development of the testis in the pig. Biol Reprod.* 63, 1629-36.
10. Good, G., Desclaude, J., Drogoul, C., Gadoud, R., Jussiau, R., Montmeas, L., 2005. *Reproduction of farm animals. Educagri edition, second edition, 407pp.*
11. Good, G.J., Desclaude, C., Drogoul, R., Gadoud, R., Jussiau, A., Montmeas, G. Robin., 1988. *Reproduction of farmed mammals. INRAP Collection, Editions Foucher, 239 pp.*
12. Gordon, I., 1997. *Controlled reproduction in sheep and goats. CAB International, University Press, Cambridge, PP. 273.*
13. Hochereau-de-Reviere, MT., Monet-Kunts, C., Courot, M., 1987. *Spermatogenesis and Sertoli cell numbers and function in rams and bulls. J. Reprod Fertil.* 34, 101-14.
14. Hugo, Peter, W., 1975. *Precise histology and microscopic anatomy of domestic animals. 6th ed vigot brothers' editors 23rue of the Paris School of Medicine, pp. 110-121.*
15. Lee, V.W.K., Cumming, I.A., Kretser, D.M., Findlay, J.K., Hudson, B., Keogh, E.J., 1976. *Regulation of gonadotropin secretion in rams from birth to sexual maturity. I. Plasma LH, FSH and testosterone levels. J. Reprod Fertil.* 46, 1-6.
16. Lee, V.W.K., Cumming, I.A., Kretser, D.M., Findlay, J.K., Hudson, B., Keogh, E.J., 1976. *Regulation of gonadotropin secretion in rams from birth to sexual maturity II. Response of the pituitary-testicular axis to LH-RH infusion. J. Reprod Fertil.* 46, 7-11.
17. Madani, T.T., Chaouia, F., Abbas, K., 2009. *Effect of oestrus synchronization and body condition on reproduction on anoestrus Ouled Djellal ewes. Asian Journal of Animal and Veterinary. Advanced.* 4 (1), 34-40.
18. Malpoux, B., 2001. *Environment and rhythms of reproduction. In Thibault, C., Levasseur, M.C. Reproduction in mammals and humans, pp. 699-724.*
19. Salhaba.S.A.Zrkawi.M., Wardehc.M.F., 2001. *Development of testicular dimensions and size, and their relationship to age, body weight and parental size in growing Awassi ram lambs. Small Ruminant Research* 40.187-191
20. Silvana, A., Giampaolo B., Debora G., Fausto C., 2010. *Morpho- and Histometric Evaluations on the Testis and Epididymis in Buffalo Bulls During the Different Reproductive Seasons. Open Anatomy Journal,* 2, 29-33 29
21. Wheeler, P.R., Burkit, H.G., Daniels, V.G., 1985. *Functional histology. Office edition of university publications. France, pp. 243-253.*
22. Wrobel, K.H., 2000. *Prespermatogenesis and spermatogoniogenesis in the bovine testis. Anat Embryol.* 202, 209-22.