تقييم الدورة الخلوية المنوية أثناء العقم الصيفى فى الجاموس

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الملخص العربى

أوضح التقييم الكمى ودراسة الدورة الخلوية المئوية أن العدد الكلى لخلايا التوالد فى خصى الجاموس ينقص فى الصيف عن الشتاء وكانت خلايا الأسبرماتيد أكثر الخلايا تأثراً بينما كانت خلايا الأسبرماتوجونيا ثابتة .

لم تتأثر خلايا الأسبرماتوسيت أولية التميز وهى البريليتوتين والليتوتين ونقصت خلايا الاسبرماتوسيت المتقدمة التميز نقصا معنويا وهى الزيجوتين والباكتيين . صوحب نقص الاسبرماتوسيت الثانوية بأشكال مجهضة للانقسام الاختزالى .

نقصت خلايا سيرتولى وكانت النسبة الخلوية السيرتولية لا تمثل حقيقة التغير فى الدورة الخلوية .

ثبت أن قطر الأنابيب المنوية مؤشر حساس للدورة الخلوية المنوية وكان عدد خلايا ليدج ثابت فى الصيف والشتاء ولكن ظهرت استحالات فى سبتوبلازما هذه الخلايا .

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EVALUATION OF THE SPERMATOGENIC CELL CYCLE IN SUMMER STRILITY OF BUFFALOES

(With 4 tables and 8 Figures)

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SUMMARY

Studies of the spermatogenic cycle and quantification of the germ cells during winter and summer in buffaloes revealed that the total number of germ cells decreased in summer The spermatids were the highlv affected cells. while the number of spermatogonia was stable. The early differentiated type of spermatocytes preleptotene and leptotene were not affected. The advancely differentiated types zygotene and pachytene demonstrated significant decrease. The decrease in the number of secondry spermatocytes was associated with stunted mioses. The sertoli cells decreased in summer and the sertoli cell ratio was un representative. The djameter of semineferous tubules was sensitive index to the condition of the spermatogenic cycle. The number of leydig cells was stable, but their cytoplasm showed degenerative changes.

INTRODUCTION

Several years clinical observation in governmental buffaloes farm at Hawotka Assiut province and in the clinic of Faculty of Veterinary Medicine had showed that sires of buffalo bulls completely loose lipido to copulate female in *estrous* during the peak of summer season "May and juli. Even to the extent that it is impossible to gather semen for evaluation and diagnosis. Examination of biopsy specimens from these bulls microscopically did not demonestrate any inflammatory changes but showed slight to mild degenerative changes. The question raised was whatever these changes are properly due to summer temperature, and if so what are the quantitative and qualitative changes which can be atributed to it.

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Several works had described the different associations of the cells of seminiferous tubules in regular spermatogenic cell cycle (ROOSEN - RUNGE and GIESEL, 1950, in rat; ROOSEN - RUNGE, 1962, in rat, mice and ram; CLERMONT, 1963; in man, and COOUROT, and ORTAVAN, 1970, in bull). CLERMONT (1963) suggested the spermatogenic cell cycle as a bases for physiological and pathological evaluation of the changes in the testes. SKAKKEBAEK and HELLER (1973) had applied quantitative analyses of the different types of cells in the spermatogenic cycle employing the sertoli cell number as a basis for reference. The variation in the so called Sertoli cell ratio was in his openion an efficient method for quantitative evaluation of a spermatogenesis.

This work aim to confirm and evaluate quantitatively and qualitatively the influence of summer temperature on the spermatogenic cell cycle of buffaloes using the Sertoli cell ratio.

Materials and Methods

The work started by examination of testicular biopsy specimens from 12 sires buffaloe bulls at Hawatka Governmental farm during the Summer SEASON of 1973. To confirm the effect of seasonal temperature random testicular specimens were obtained from antimortem healthy and post mortem free buffaloe bulls over 3 years old at Assiut slaughter house. The first control group of specimens were taken from 10 animals during winter season (January and February, 1974). The second group of specimens were taken from 10 animals during the summer season (May and Juli, 1974). The third group (10 animals), the specimens were obtained during the next summer season (May and Juli, 1975).

Specimens were fixed in Zenker's formel solution. Paraffin sections were stained by Harris Haematoxylin and eosin. Randumly shoosen cross sections of seminiferous tubules were used for the study. Tangentially cut tubules were avoided. A total of thirty tubular cross sections were used for counting the cell types and classification of the cycle in each case.

The cells of the seminiferous epithelium and the cyclic stages were classified according to the criteria given by COURT ET; AL. (1970), for bull. Differentiation was made between type A pale (AP) and type A dark (AD) spermatogonia. Spermatocytes were classified as preleptotene (Pl,) leptotene (L), Zygotene (Z) and Pachytene (P) spermatocytes.

Zygotene and pachytene were grouped together. The secondary spermatocytes were recorded. Spermatids were classified as rounded early spermatid (SA), (SB) and late elongated spermatid (SC), (SD) In addition to the germ cells, all sertoli cells with vesible nuclei were counted.

The mean number of the counted germ cells of each of the different typeswas devided by the mean number of the sertoli cells in 30 cross sections of tubules. The result and value is refered as sertoli cell ratio for each case.

The mean diameter of 30 cross section of seminiferous tubules was measured in each case.

The number of leydig cells aggregated between the cross sections of four seminiferous tubules was counted. The mean number of 30 randemly shosen islets was obtained for each case.

Any quantitative pathological changes in the cytoplasm and nucleus in any type of these cells were described. The data obtained from these different index in the 3 groups were tested for significance by analysis of variance (SENDECOR, and COCHRAN 1967).

RESULTS

The result of quantification of the germ cells is demonestrated in table (1). The total germ cells number was reduced in the first summer season in comparison to the winter (163.9) to half its number (84.3). In the second summer season the number decreased one third (105.7) than that of winter.

The pale spermatogonia were sensitive than the dark spermatogonia. They showed degenerative changes in form of vacoular proteinous dystrophy in their cytoplasm. The dark spermatogonia were more or less resistant. The number of pale spermatogonia decreased to (6.3) and (4.8) in the first and second groups of summer than that of winter (11.4). The dark spermatogonia recorded significant increase (12.3) and highly significant increase (14.3) in summer than that of winter (7.8). As a result the total number of spermatogonia was stable and not affected within the three groups.

Differentially from the stable number of the total spermatogonia the spermatids were the highly sensitive and affected cells. The mean number of the total spermatids (75.6) in winter was decreased to (34.6) and (39.1) in summer. The mean number of SA and SB spermatids was (51.4) in winter and was lower to (25.8) and (28) in both Summer first and Second group.

TABLE 1. The cell types mean number of 30 seminiferous tubules during winter and summer

ypes of cells		Winter (1974) (10 cases)			Summer (1974) (10 Cases)			Summer 1974 (10 cases)		
		Range	mean		Range	mean		Range	mean	
spermatogonia	AP	8.1 — 15.5	11.4	± 0.7	2 — 10.9	6.3x	± 1.9	0.1 — 12.2	4.8xx	± 1.3
	AD	3.3 — 13.9	7.8	± 0.9	5.3 — 20	14.3xx	± 1.5	4.6 — 20.4	12.3x	± 1.6
	Total	13.5 — 24.9	19.2	± 1.3	12.3 — 24.1	20.6	± 1.3	7.8 — 24.1	17.0	± 2.2
spermatocytes	PL	.06— 25.9	2.5	± 0.8	0 — 16.7	5.0	± 1.7	0.43 — 14	5.4°	± 1.4
	L	6.2 — 27.5	16.8	± 2.4	5.5 — 26.8	14.7°	± 2.0	4.9 — 29.1	15.3°	± 2.9
	Z-P	23.3 — 52.6	39.6	± 2.8	0 — 23.5	6.7xx	± 2.6	1.0 — 47.8	16.9xx	± 4.2
	sc_{sp}	0.75 — 21.9	11.4	± 2.6	0 — 11.6	2.7xx	± 1.2	0 — 51.3	12.0	± 5
	Total	44.5 — 87.9	69.1	± 4.29	12.3— 60.9	29. xx	± 4.9	11.1 —100.9	49.5°	± 9.0
spermatids	sa-sb	35 — 65.7	51.4	± 3.2	0 — 69.1	25.8xx	± 7.0	9.8 — 69.1	28. xx	± 6.0
	sc-sd	11.5 — 39.8	24.2	± 2.6	0 — 20.3	8.8xx	± 2.1	5.3 — 19.5	11.2xx	± 1.3
	Total	54.7 — 93.5	75.6	± 3.65	2.6 — 81.8	34.6xx	± 7.9	19.9 — 81.8	39.1xx	± 6.8
Sertoli cell		7.8 — 12.5	11	± 0.5	0.2 — 8.7	3.3xx	± 1.0	1.8 — 13	7.2x	± 1.3
Total		121 — 182.3	163.9	± 5.6	42.9 — 166.8	84.3xx	±11.6	59.6 — 166.8	105.7xx	±12.4

* Non significant.
x significant,
xx high ly significant
± stander deviation,

There was increased amount of cytoplasmic remainents sheded during the differentiation of mature spermatids. This was increasingly unpropo rtionate to the actual number of the SD spermatids present, indicating lysis of the majority of them (Fig, 3,4). The mean number of the advancely differentiated spermatids SC and SD in winter was(24.2) and it decreased to (8.8) in the first and (11.2) in the second summer seasons.

The secondary spermatocytes demonestrated *significant* decrease in the first group of summer season (2.7)from (11.4) in winter. In the second group of summer season, there was no significant variation from winter. Although in both groups, these cells were associated with figures of stunted mioses of the dividing primary spermatocytes.

The mean number of the early differentiated types of primary spermatocytes preleptolene and leptotene was not affected within the three groups Although in summer, some cells manifested hydropic proteinous dystrophy with vacuclation of the cytoplasm / (Fig 1). In few celis the cytoplasmic lysis was sever to the extent of leaving bare nuclei. The advancely differentiated types zygotene and pachytene demonestrated *highly significant* decrease from (39.6) in winter to (6.7) in the first and (16.9) in the second group of summer. On the contrary, these cells seem to resist longer the degenerative changes , (Fig. 2).

The sertoli cell ratio was unrepresentative for the actual changes which occur in each type of germ cells between the three groups (table 2). This is due to the variability in the number of sertoli to be reffered. The sertoli cells manifested variable degrees of hydropic protenious dystrophy up to total lysis of the sertoli cells (Fig 2). The sertoli cells *showed high significant* decrease form 11 in winter to 3.3 and 7.2 in summer. The sertoli cell ratio was increased for both the spermatogonia and total number of germ cells. Although the actual number of spermatogonia was stable and the total number of germ cells was decreased. This increase of the sertoli ratio was false and arised from the decreased number of sertoli. Sertoli cell ratio may be representative to evaluate quantitatively the spermatogenic cell cycle within the physiological range of activity when the number of sertoli cells is stable. But in patholcgical conditicns, the sertoli cells are highly sensitive to alteration and the ratio is unrepresentative.

Measurements of the mean diameter of thirty seminiferous tubules were sensitive index to the condition oi spermatogenic cycle. The mean diameter was (35.08μ) in winter and decreased to (18.8 μ) and (17.9 μ) in summer. (Fig.1).

No significant changes were demonstrated in the number of leydig cells between the winter and summer groups. In the first summer group, there were 3 cells higher. But in our openion, this increase is not significant as the aggre-

TABLE 2. Mean diameter of 30 seminiferous tubules during winter and summer (micron)

Case No.	Winter (1974)			Summer (1974)			Summer (1975)		
	Range	Mean		Range	Mean		Range	Mean	
1	25.84 — 44.88	31.28	± 0.7	13.60 — 20.40	19.49	± 0.4	13.60 — 21.76	18.40	± 0.2
2	28.56 — 43.52	35.36	± 0.5	16.32 — 27.20	20.58	± 0.3	16.32 — 25.84	20.48	± 0.2
3	29.92 — 43.52	38.08	± 0.4	13.60 — 25.84	19.26	± 0.4	10.88 — 19.04	15.99	± 0.1
4	28.56 — 38.08	32.64	± 0.7	13.60 — 20.40	16.50	± 0.2	13.60 — 23.12	20.75	± 0.2
5	31.28 — 43.52	35.36	± 0.4	12.24 — 23.12	18.22	± 0.3	13.60 — 19.04	15.88	± 0.1
6	25.84 — 38.08	34.00	± 0.5	14.96 — 23.12	17.72	± 0.2	12.24 — 23.12	16.08	± 0.3
7	28.56 — 43.52	34.00	± 0.5	12.24 — 20.40	16.54	± 0.2	14.96 — 23.12	18.26	± 0.3
8	27.20 — 40.80	34.00	± 0.4	13.60 — 27.20	17.94	± 0.3	13.60 — 23.12	18 71	± 0.2
9	32.64 — 50.32	40.80	± 0.7	14.96 — 27.20	20.94	± 0.4	13.60 — 21.76	18.26	± 0 3
10	27.20 — 46.24	35.36	± 0.7	17.68 — 24.48	21.16	± 0.2	12.23 — 23.20	16.16	± 0.2
Total. mean		35.08	± 0.8		18.84	± 0.5		17.90	± 0.6

gation and distribution of leydig cells are more or less histologicaly not regular Qualitative changes in leydig cells were observed in the form of loss of characteristic vacuclation of the fine lipid droplets, granulation of the cytcplasm and in some cells hyalinization of cytoplasm.

There were variations in the cyclic stages of the spermatogenesis in the summer groups than that of winter. In summer, the seminiferous tubules demonstrated lower stages of the cycle. Stages from 1-5 were the most frequent and advanced stages from 5-8 were of rare frequency. Abnormal associations of germ cells were observed. Some seminiferous tubules showed the presence of spermatogonia and spermatids with abscence of spermatocytes. (Fig 5, 6) Others, demonstrated the presence of dark spermatogonia and lysis of pale spermatogonia. The preleptotenes were the only present cells from the spermatocyte series. Although, the various types of spermatids were present. Some seminiferous tubules were totally empty with the bare basement membranes. (Fig 7). Still another seminiferous tubules demonestrated aggregation of the spermatocytes and spermatids around the sertoli cells constituting the sertoli trees with spaces inbetween indicating lower production (Fig. 8).

TABLE 3. **Mean number of 30 islets of leydig cells during winter and summer**

Case No.	Winter (1974)			Summer (1974)		Summer (1975)	
	Range	Mean		Range	Means	Range	Mean
1	10 — 36	18.4	± 1.2	3 — 46	19.4 ± 1.8	2. — 23	9.9 ± 1.0
2	2 — 32	13.7	± 1.1	7 — 57	22.5 ± 2.2	8 — 19	14.0 ± 1.1
3	4 — 17	9.5	± 0.6	9. — 30	18.2 ± 1.2	6 — 26	15.8 ± 1.0
4	7 — 55	17.4	± 2.0	5 — 37	18.9 ± 1.5	3 — 19	12.6 ± 0.9
5	4 — 33	15.3	± 1.4	7 — 42	16.9 ± 1.3	5 — 36	16.6 ± 1.2
6	4 — 66	17.3	± 2.3	5 — 37	16.1 ± 1.4	6 — 18	13.3 ± 0.6
7	5 — 20	11.9	± 1.0	9 — 38	17.5 ± 1.2	8 — 34	14.2 ± 1.4
8	3 — 43	18.0	± 1.9	4 — 45	17.7 ± 1.7	5 — 25	14.0 ± 1.0
9	4 — 30	12.9	± 1.3	4 — 21	12.3 ± 0.8	3 — 25	13.3 ± 1.0
10	4 — 23	9.2	± 0.8	9 — 31	18.4 ± 1.3	3 — 34	13.9 ± 1.1
Total. mean		14.4	± 1.0		17.8 ± 0.8		13.76± 3.7

TABLE 4. **The sertoli cell ratio of a mean of 30 seminiferous tubules during winter and summer**

Types of cells		Winter (1974) (10 cases)			Summer (1974) (10 cases)			Summer (1975) (10 cases)		
		Range	mean		Range	mean		Range	mean	
Spermatogonia	AP	0.67 — 1.89	1.07	± 0.1	0.04 — 6.77	1.5	± 0.7	0.04 — 54.20	7.8	± 5.2
	AD	0.27 — 1.43	0.74	± 0.1	0.81 — 9.44	2.7	± 0.9	0.90 — 61.56	14.0	± 5.9
	Total	1.11 — 2.79	1.81	± 0.2	0.83 — 16.21	4.2	± 1.5	1.50 — 116.00	21.8	± 10.2
Spermatocytes	PL	0.0 — 0.61	0.23	± 0.1	0.05 — 7.77	1.2	± 0.7	0 — 50	7.98	± 4.9
	L	0.63 — 2.21	1.53	± 0.2	0.40 — 16.16	3.7	± 1.7	1.8 — 27.5	9.5	± 2.9
	Z-P	2.78 — 4.34	3.60	± 0.2	0.24 — 26.55	4.6	± 2.5	0 — 9.28	2.33	± 0.9
	Sc-Sp	0.0 — 1.75	0.91	± 0.2	0.00 — 8. 99	2.3	± 0.9	0 — 2.58	0.69	± 0.9
	Total	4.48 — 7.33	6.25	± 0.2	1.80 — 56.03	11.9	± 5.1	3.24 — 77.5	20.53	± 7.5
Spermatids	Sa-sb	3.21 — 6.53	4.8	± 0.4	0.75 — 9.3	4.6	± 0.8	0. — 64	18.51	± 7.0
	Sc-SD	1.47 — 2.66	2.17	± 0.2	0.26 — 10.83	2.6	± 0.9	0. — 18.5	5.06	± 1.0
	Total	5.12 — 8.60	6.95	± 0.3	1.65 — 16.66	7.2	± 1.5	0.58 — 73.5	23.9	± 8.0
Sertoli cell	—	7.8 — 12.5	11.00	±0.5	1.80 — 11.90	7.2	± 1.3	0.2 — 8.5	3.3	± 0.0
Total ratio	—	12.89 — 17.54	5.04	± 0.4	5.30 — 88.83	23.3	± 7.7	8.13 —267.5	65.97	± 2.50

Discussion

The reduction of the total germ cells number in summer is a fact universally stated through works with semen evaluation. The adverse effect of summer season was related to high temperature, increased duration of light exposure and relative humidity. SALISBURG and VANDEMARK (1961) surveying the results of 34 investigation from different parts of the world, found that the highest fertility was in the spring and the lowest was in summer. SEN GUPTA, MISRA and ROY (1963) MISRA and SEN GUPTA, (1965) and SINHA, SEN GUPTA and ROY, (1966) have shown decrease in the percent of live sperms during summer in indian buffaloes. Buffalo bulls given almost no protection against heat stress in summer rapidly lost lipido and semen quality of ejaculates just prior to loss of lipido was poor. SOEV. APOSIOLOV and LALKOV (1966) reported from Belgaria that high and low atmospheric temperatrure and sudden temperature changes associated with high relative humidity were related to subsequent reduction in the ejaculate volume, sperm numbers and sperm servival in buffalo.

Quantification of the germ cells showed that while the spermatids were the most senstive and affected cells, the total mumber of spermatogonia did not show variation in the two summer seasons from winter and remain more less constant. A fact confirmed by the MOORE (1924), NELSON (1951), PAYNE (1956); CLEGG (1963). The spermatogonia resisted the action of heat either in cryptorchid animals or by artificial elevation of temperature or through survival of abdominal temperature in geunia pig, mouse, pigs and rats.

Within the stability of the total number of spermatogonia, there was a decrease in number of type A spermatogonia and an increase in type B spermatogonia. The decrease of type A was accompanied by degenerative changes. Experimentally, raising of the temperature of testicle up to 43 C° for 15 min (CHOWDHURY and STELNBERGER, 1963; 1964) or for 30 min (COLLINS and LACY, 1969) lead to degeneration of spermagonia, a fact which confirm our findings.

The decrease of type A spermatogonia was compensated by increase in type B. The increase of B type spermatogonia conicided the work of SKINNER and LOUW (1966) who reported an apparent tendency for the number of spermatogonia in mitotic divison to increase after Bulls are exposed to high air temperature. WAITES and ORTAVANT (1967), demonestrated that while the A type spermatogonia were not affected by heat treatment in rams, the number of B type spermatogonia increased four to five times when heated to 40°C for about 2½ hour. Many of these cells do not complete mitoses and are apparently blocked between prophase and metaphase. In the authors openion, this was considered to be evidence for synchronization of cell division among spermatogonia.

The number of early differentiated types of spermatocytes were not affected during the summer season, although they manifest degenerative vacuolation in their cytoplasm. In our openion, these degenerative changes account for the considerable loss of the number of advancely diffrentiated spermatocytes. Survey of literature demonstrated that the primary spermatocytes were specifically thermally sonsetive in all species examined. The Pachytene spermatocytes were the first cell to die following increase testicular temperature in pig (YOUNG 1927) and in rat (STEINBERGER and DIXON 1959; CHOWDHURY, STEINBERGER, (1964) STEINBERGER, STEINBERGER, VILAR, SOLAMAN and SUD 1967, COLLINS and LACY, 1969). The pachytene spermatocytes of sheep and pig pass through thermally senstive period toward the end of stage 7 and the begning of stage 8 (WAITS, and ORTAVANT, 1967). Diplotene spermatocytes were considerably reduced in the pig testis (MAZZARRI ET AL, 1970).

The secondery spermatocytes decreased in number in summer season. This result is supported by data in rat (STEINBERGER and DIXON 1959; CHOWDHURY and STEINBERGER, 1963, 1964, and COLLINS and LACY 1969) and sheep (WAITES and ORTAVANT 1967). The previous authors also observed abnormal mitotic figures in sheep like that observed by us in buffaloes. Our observation emphasizes the openion of ORTAVANT, (1959) CLERMONT, (1962) ROSSEN - RUNGE (1962) that heat cause losses of mioses. The losses of mioses account for the decrease in the number of round spermatids observed at later stages.

The spermatids suffered the highest losses in summer. The adverse affect of the summer season on the number of spermatids in buffaloes was also observed soon after temperature elevation in rats (CHOWDHURY and STEINBERGER 1963 1964, NIEMA and KORMANO 1965), sheep (WAITES and ORTVANT 1967) and pig (MAZZARI ET AL 1970). Simillar losses were inferred from changes in bull semen (AUSTIN ET AL, 1961; SKINNER and LOUW, 1966).

The losses in the number of sertoli cells and their degenerative changes observed during summer has a central significance for both retarded spermato- and spermio-genesis. This can be explained by surveying the function of the sertoli cells. The sertoli cells contribute to the organization and cohession of the whole semineferous epithelium as all the germ cells except the spermatogonia are serounded by cytopalsmic processes of the sertoli cells (NICANDER 1967). The sertoli cells through this contact control the exchanges of metabolites in and between the germ cells (ROOSEN - RUNGE 1962). Sertoli cells Coardinate the whole process of spermatogenesis (LACY, 1967). It has been demonestrated that, only when the elongated spermatids implanted in the Sertoli cytoplasm are released, the production of young spermatids occur. This organization is varified by the phagocytic activity of the sertoli cells and phagocytosis of the spermatid residual bodies (LACY, 1960; ROOSEN - RUNGE 1962 ; COLLINS ET AL, 1968).

Thus losses of sertoli cells are responsible for the degenerative changes both in spermatocytes and spermatids due to lake of metabolites exchanges of these cells. The loss of sertoli - the organizator of spermatogenesis-will explain the abnormal cyclic stages of germ cell association observed in summer.

The number of leydig cell was not changed in summer season. Work with cryptorchid testicles (CLEGG 1961, HALL, 1965 LEVIER, 1968 and LEVIER and SPAZIONT 1968) had demonestrated that elevated testicular temperature do not interfer with the number, morphological integrity of the leydig cells or with their differentiation but it leads to lower androgen production. In our work, the loss of fine droplet lipid granules, granulation and hyalinization of some cells are morphological indecess for this fact. Although, the increased number of the leydig cell in the first summer season was interpretted to be due to more or less unregularity in the aggregation and disitribution of leydig cell. CLEGG (1961), reported transit increase of the leydig cells about 21 day after cryptorchidization in the rat when the production of androgens appears to be lost. Androgen may stimulate certain aspect of spermatogenic activity but administration of androgen by CRUMLY (1969) to cryptorchid rat do not counter act the damaging effect of higher temprature on the process of spermatogenesis.

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Figure (1) **Corrigation of the seminiferous tubules contour. Degeneration of preleptene and leptotene spermatocytes.** H & E 12.5 X 35

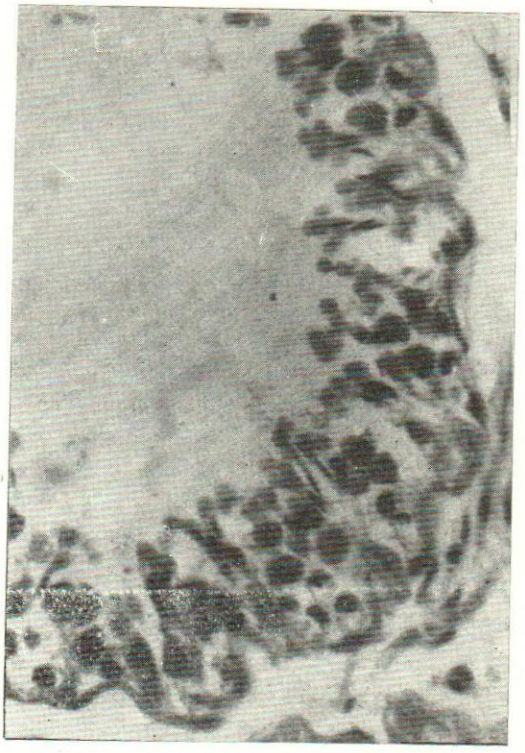

Figure (2) **Vacoulative lysis of sertoli cytoplasm. Zygotene and pachytene more or less normal.** H & E 12.5 X 40

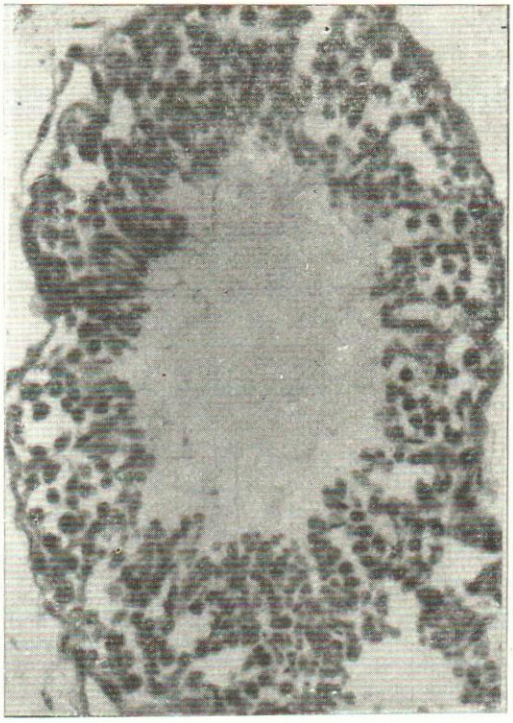

Figure (3) Degeneration of the spermatocytes The elongated spermatids are reduced severely in number than rounded. H & E 12.5 X 25

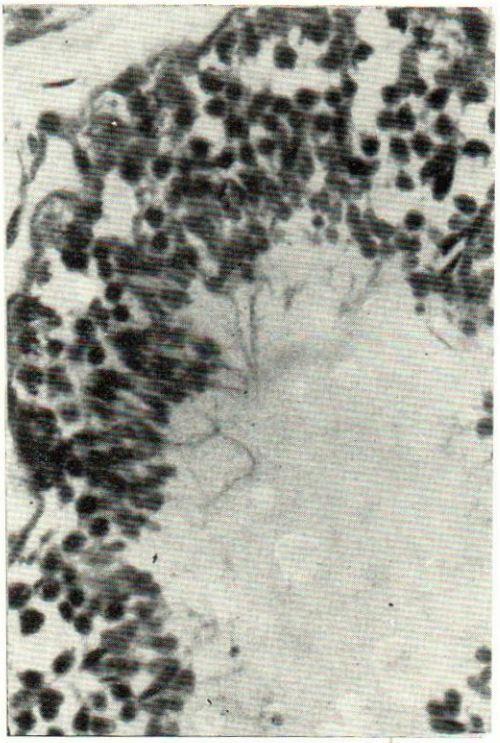

Figure (4) **Residual cytoplasmic processes increasingly unproprtionate to the number of elongated spermatids.** H & E. 12.5 X 40.

Figure (5) **Abnormal association of germ cells presence of elongated and round spermatid. Nearly absence of spermatocyes.** H & E. 12.5 X 25

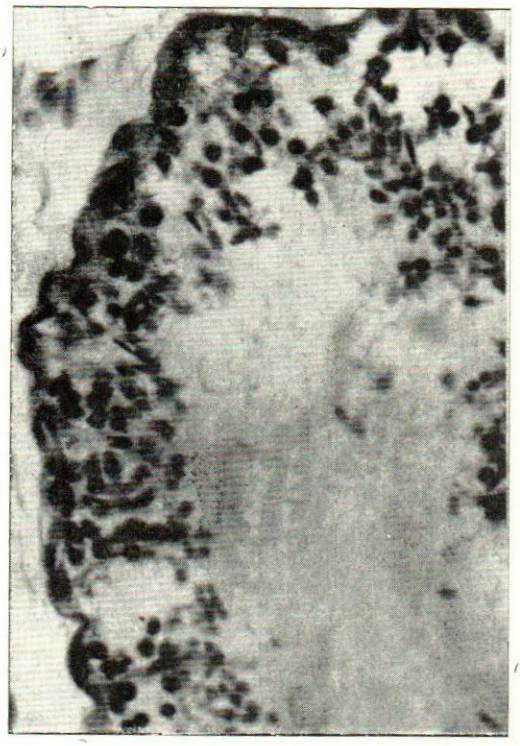

Figure (6) Abnormal association of germ cells presence of elongated and round spermatid. Nearly abscence of spermatocyes. H & E 12. X 40

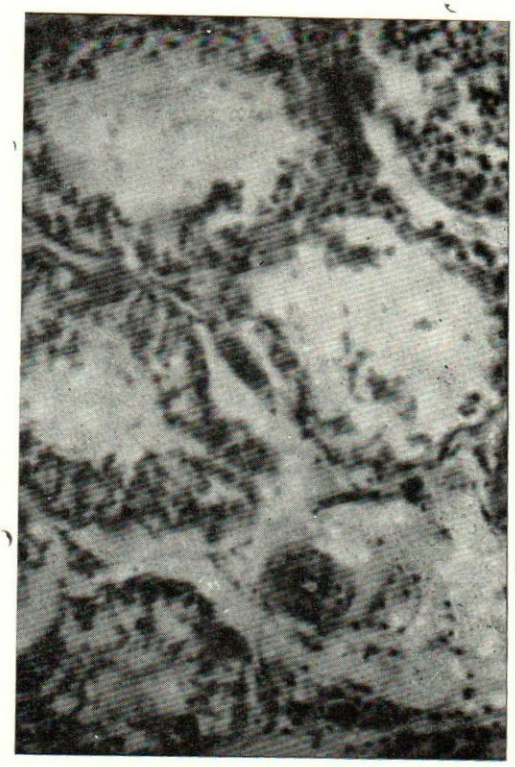

Figure (7) Total absence of germ cells with bare B.M. except for few number of spermatogonia. H & E. 12.5 X 10.

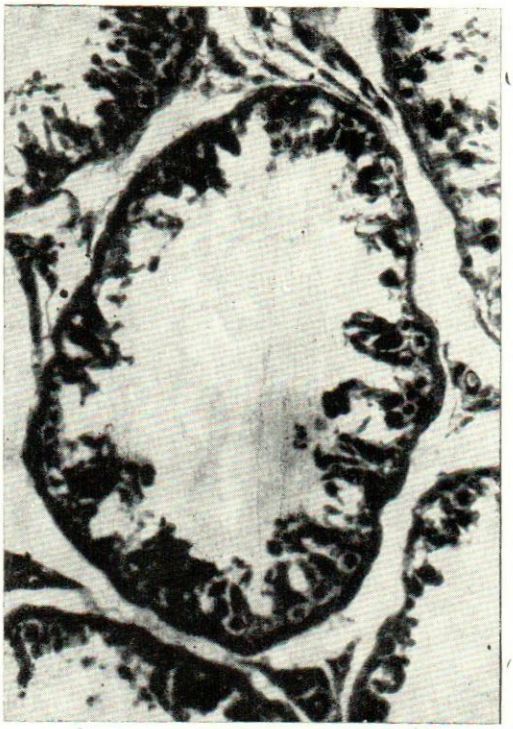

Figure (8) Low production of germ cells around the Sertoli forming sertoli trees with spaces inbetween. H & E. 12.5 X 25.