

CONTINUOUS ILLUMINATION AND OOGENESIS IN ALBINO RABBITS

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Summary : Photo periodism is probably a phenomenon of natural selection. The critical period of ovulation can be adjusted to the environmental condition such as exposure to continuous illumination (LL) at constant temperature. Many investigators have also observed that blindness in girls causes early menarche while opposite results are obtained in rats. The present study was based upon the changes in circadian rhythm of ovaries of albino rabbits, by exposing the animals to continuous illumination through an electric bulb of 100 watt kept at one metre distance, at 37°C, vaginal smear showed constant estrus. It was observed that degenerative changes started appearing in the histology of ovaries from first week of experiment. Degenerative changes were gradual and led to complete metaplasia or atrophy of ovary.

Key words: persistent estrus continuous illumination(LL) and ovaries polycystic ovary

INTRODUCTION

Androsteom (500 B.C.) (1) described phototactic movements in plants. Changes in the usual diurnal rhythm induce endogenous changes in the functional chemistry of cells and behaviour of organism (8, 14). Seasonal variations and changes in normal light and dark ratio (14 : 10) controls the onset of mating behaviour and vaginal cornification (2, 19) gonadal development and activity, (12, 13, 15, 16, 17, 20) Exposure to LL can cause delay in ovulation (2) and critical period in P.M.S. treated rats, (3, 5, 6, 21).

MATERIAL AND METHODS

Female albino rabbits weighting 1 kg were isolated in separate cages and were fed upon soaked gram and water *ad lib*. Animals were divided in following two groups.

Group I (Standard) : 20 female albino rabbits exposed to normal L.D. (14/10) ratio.

Group II : 20 female albino rabbits were exposed to continuous illumination for 24 hours with 100 watt., fluorescent bulb kept at one metre distance. Temperature was maintained at 37°C. Rabbits from each group were sacrificed after every 3rd day from the beginning of experiment till the end. Gonads were taken out and were fixed in Bouin's solution. Endometrial biopsies were not studied.

Permanent microslides of transverse section of ovaries obtained were prepared and studied under low and high power objective of compound microscope (eyepiece-10 x).

RESULTS

The present study reveals that the ovaries of albino rabbits looked bigger in size with multiple follicles and cysts. Histological studies presented a picture of polycystic follicle with single granulosa cell layer (Fig. 1-G).

It was not possible to differentiate the normal structure of oocyte with cumulus oophorus and granulosa cells. Interstitial tissue was packed with mitotic cells.

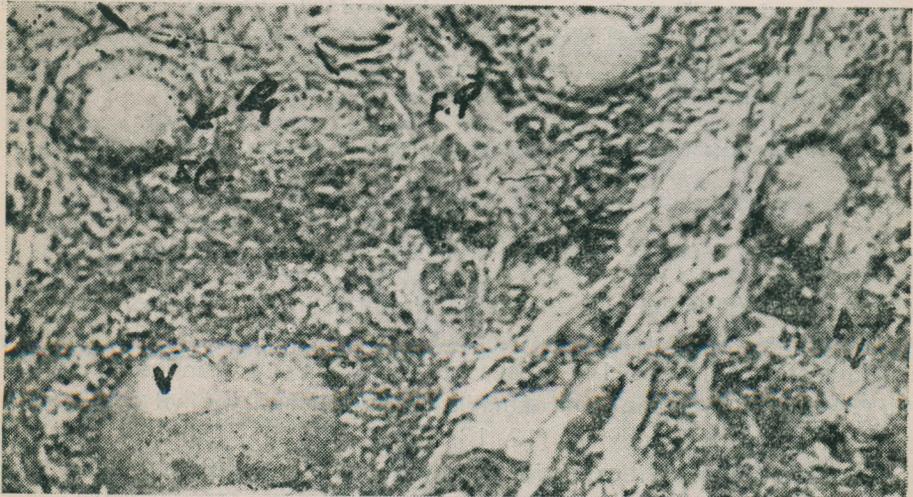


Fig. 1 : Polycystic ovary (430%)

- AF = Atresic Follicle, BV = Blood Vessel
 F.T = Fibrous Tissue, G = Granulosa Cell layer
 V = Vacuoles in oocyte

Many follicles were vesicular, had vacuoles (V) and theca granulosa cell layer, interstitial tissue was abundant with many blood vessels and fibrous tissue. Very few follicles had standard mature follicular configuration.

Microslides during 2nd week showed intense proliferation with thick capsule (Fig. 2-FC) and indistinct germinal layer. Number of primordial and atresic follicles were dominant (Fig. 2). There was intensive mitotic cell division in medulla.

Histological findings during 3rd week :

Fig. 2 presented almost similar picture, cortex was thick and it became difficult to define cellular details of germinal epithelium. Zona Pellucida or cumulus oophorus were not seen. Oocytes looked like a compact mass. There was no antrum folliculi. Major part of ovary was made up of medulla.

Histological findings : during 4th week, oocyte was completely degenerated and became asymmetrical alongwith cavities surrounded by single granulosa cell layer (Fig. 2). Most of the follicles were small. In medulla mitosis (M) and fibrosis, was intensive, a trespic follicle (A) and hyaline patches were also found.

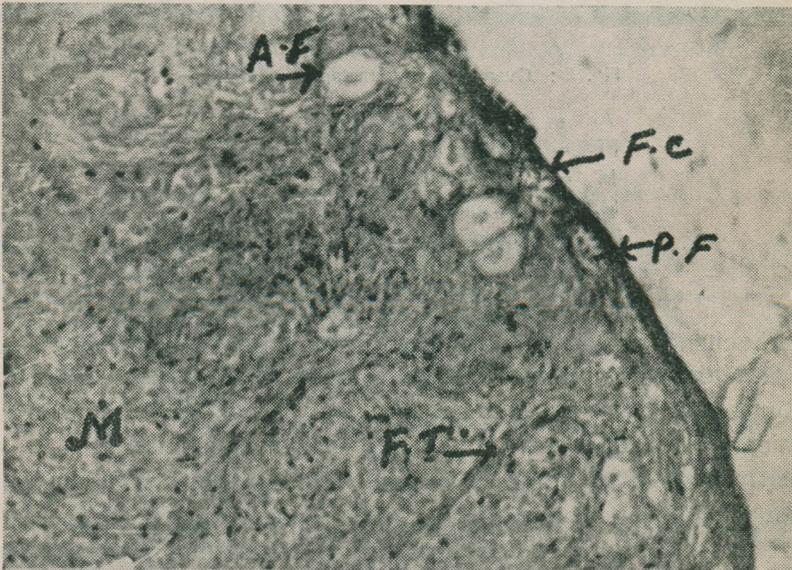


Fig. 2 : Degenerating ovary (330)

- AF = Atresic Follicle, P.F = Primordial follicle
- F.T. = Fibrous Tissue, F.C. = Fibrous Capsule
- M. = Mitotic Medulla

T.S. of ovaries after 7th week : Size of ovary was markedly reduced. In some specimens granulosa cells showed columnar metaplasia (Fig. 3-M.P.).



Fig. 3 : Ovary showing metaplasia (430x)

- AF = Atrasic Follicle
- FT = Fibrous Tissue
- M = Mitotic Medulla
- MP = Metaplasia
- PF = Premordial Follicle

DISCUSSION

The early changes after LL had the tendency, on one hand towards degeneration, while excessive mitosis and increased number of primordial follicles probably suggests that excessive amount of estrogen was produced and ovary was trying to compensate and undo the degeneration. Polycystic ovary alongwith virilism and increased 17-ketosteroid in urine has been described as a sign of atresia and degeneration. Pituitary gland secretes increased amount of Gonadotropic hormone (18) which can stimulate oogenesis, mitosis of interstitial tissue and estrogen production. Sexual periodicity has also been cited alongwith polycystic ovaries (9, 10). Observation of the present study support the above postulate and findings of many other investigators who have suggested that imbalance in normal regulation of gonadotropins, induce the degenerative changes leading to atresia and ovaries resemble Stein Leventhal ovary (8, 9, 11).

Appearance of polycystic ovary suggests that cyclic pattern of gonadotropins release was abolished leading to disharmonic development of oogenetic apparatus. Continuous stimulation of gonads by gonadotropins produced degenerative changes. Most striking finding was the appearance of two kinds of follicles. First type, with well developed theca, hyperplastic and active granulosa cell layer without cumulus oophorus, suggesting hyperplastic interstitium. The second type of changes found were vesicular and atretic follicles with intense fibrosis, suggesting degeneration. Takawakis (22) has cited that ovaries exposed to L.L. were comprised of anovulatory follicles, some of which were cystic and contained no corpora lutea. Hormonal imbalance leading to polycystic ovaries has already been cited (19, 10). Similar results were obtained in our studies. Further it was observed that prolonged exposure to LL induced metaplasia similar to metaplasia observed by Bern (4).

Conclusion : Continuous illumination induces degenerative changes in albino rabbits with polycystic ovary and other degenerative changes such as metaplasia of follicular epithelium. Perhaps during gonadotropins tried to compensate degenerative changes, but prolonged exposure lowered the blood level of gonadotropin. Hence it is concluded that continuous illumination is detrimental to oogenetic apparatus of albino rabbit. Continuous illumination during first 2 days make the ovary hyperplastic but anovulatory. This anovulatory sex cycles in females is one of the aims of family planning. Late changes need further investigations to explore the chances of reversal of physio-anatomy of ovary.

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