

## PRODUCTION OF OVOGONIA BY GERMINATIVE EPITHELIUM OF THE OVARY AT SOME MAMMALIA AND BIRDS

### PRODUÇÃO DE OVOGÔNIAS PELO EPITÉLIO GERMINATIVO DO OVÁRIO DE ALGUNS MAMÍFEROS E AVES

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#### RESUMO

The studies were effected on ovaries from sows, cows, bitches, does and hens. Our investigations revealed the generation of cellular rows of germinative epithelium into the cortex not only during the embryonic period but also in the adult ovary. The histological investigations revealed an intense proliferative process of the germinative epithelium of adult ovary which generated groups of ovogonia under the lamina basalis. From ovogonia developed oocytes and then ovarian follicles. The cause for the proliferation of ovary germinative epithelium could be: the multiple follicular dehiscences, the premature degeneration of ovarian follicles and formation of the corpus luteum, phenomena that reduce continually the number of embryonic ovogonia.

**Key words:** ovary, epithelium, mammalian, hens, proliferation, ovogonia, oocytes, ovarian follicles.

#### RESUMO

O estudo foi realizado em ovários de porcas, vacas, cadelas, corças e galinhas. Os estudos revelaram a formação de células pelo epitélio germinativo no córtex não só durante o período embrionário, mas também no ovário adulto. Os estudos histológicos indicam um intenso processo proliferativo do epitélio germinativo de ovários adultos, os quais geraram grupos de ovogônias sob a lâmina basal. A partir da ovogônia formaram-se os óócitos e após os folículos ovarianos. A causa da proliferação do epitélio ovariano germinativo poderia ser: a deiscência folicular múltipla, degeneração prematura dos folículos ovarianos e a formação do corpo lúteo, fe-

nômenos estes que reduzem continuamente o número de ovogônias embrionárias.

**Palavras-chave:** ovário, epitélio, mamíferos, galinhas, proliferação, ovogônia, óócitos e folículos ovarianos.

In most cases the authors of histology books report that the folliculogenesis process is based exclusively on ovogonia that had populated the ovary during the embryonic period.

The references material offers controversial data concerning the possibility of ovogonia formation during the postnatal period. So, WINIWARTER (1909), ZUCKERMAN et al (1978) rejected the possibility of generation of ovogonia in adult ovary while ARON & ARON (1953), DEVAINE (1940), KAZANSKI (1949), MARZA & ARATEI (1972), SINCAI (1982, 1986), maintain the hypothesis of new-forming ovogonia in adult ovary. Our recent research on some mammalian and birds ovarian tissues confirm the last hypothesis.

The research was effected on ovaries from different species: sow, cow, bitch, doe, coypu and hen in varied periods of postnatal development. Fragments of ovary were taken from sacrificed animals and prepared for histological studies with the trichrome Mallory method and for histochemical studies with periodic acid Schiff method (carbohydrates) and pyronin and methyl green method (nucleic acids). The slides were examined under the light microscope.

The examination of the slides produced from adult ovaries revealed some peculiar morphophysiological aspects that pointed to an active proliferation of the germinal epithelium and engendering of cellular rows into the cortex with the formation of new ovogonia. Thus, the histological investigations on sow's ovary showed zonal hypertrophy of the cuboidal

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epithelium and a multiplication of cells. The new forming cells lined up and penetrated into the cortex. In those cellular groups two types of cells were conspicuous. Some of them were larger, with a clear cytoplasm, almost of spheroidal form like ovogonia and gathered into nests placed beneath the germinal epithelium. Other cells were small, dark, elongated with hyperchromatic nuclei from which probably arose the follicular cells. It was also observed that in the ovogonia groups part of the cells underwent mitoses generating oocytes while the other cells suffered an involutive process. Round new forming oocytes follicular cells developed, giving rise to ovary follicles.

The cortex enclosed numerous ovary follicles in different stages of development and mature follicles which were placed through the whole cortex. Part of the ovary follicles showed degeneration.

The histochemical investigations were positive for proliferative zones of germinal epithelium comparatively with other zones. In adult cows the microscopic examination of the ovary revealed also a proliferation of germinal epithelium with formation of cellular rows linked or detached from the surface of the ovary. The cortex was full of ovogonia, part of them in mitoses and part in different phases of lysis. There were also present secondary follicles and numerous atretic follicles.

The histological study of adult ovary of the bitch and the doe showed numerous zones of proliferation of the germinal epithelium. In the bitch the surface of the ovary forms crypts where epithelial cells are hypertrophic generatin in the depth of the cortex cellular rows or cellular groups. In these, there were observed two types of cells, some larger, spheroidal and clear which generate ovogonia and others elongated, dark, which became follicular cells. Within the cortex were also observed primary, secondary and mature follicles, two or three luteum corpii and a great number of atretic follicles. The microscopic examination of adult ovary of coypu showed some peculiar morphological aspects regarding the formation and organization of ovary follicles. Ovary follicles were surrounded by a connective-muscular theca probably with an active role in ovulation. the germinal epithelium formed numerous long cellular parallel rows that penetrated the cortex in conjunction with the surface and from which were generated new follicles.

In laying hens about one year old the ovarian cortex was very rich in follicles of varied sizes. Also a large number of oocytes degenerated and became atretic follicles. In numerous zones of the ovary surface the germinal epithelium proliferated into the cortex generating groups of ovogonia and new ovarian follicles.

The microscopic examination of adult ovary from the species under investigation showed mitoses of the germinal epithelium phenomena followed by the formation of cellular groups and rows into the cortex. Because in those cellular groups were observed two cellular types which differed as much morphophysiologically as following development, we

believe in the possibility that the germinal epithelium of the adult ovary generated new ovogonia. To support this hypothesis comes the observation that in those species with a great number of descendants in one year the proliferation of germinal epithelium is more evident.

Moreover the atresia of ovogonia and follicles occurred as much in prenatal as in postnatal periods, the multiple ovulation and the formation of the corpus luteum, phenomena repeated cyclically and which modified essentially the cortex structure, lowered considerably the embrionary stock of ovogonia, inducing differentiation and proliferation of the germinal epithelium.

All these phenomena create a lack of balance of cell numbers and of connective-epithelial relationship that together with the stimulating action of new generating connective tissue could be the causes for starting of the germinal epithelium proliferation and for the forming of new ovogonia in adult ovary. This statement seems to be confirmed by the observation that in physiological infertility the ovarian epithelium is lost to sight.

So the ontogenic development as maintained and MARZA & ARATEI (1972) do not repeat only from primordial follicle but also from the proliferation of ovarian epithelium. Therefore in postnatal periods it occurs a multiple repetition of ontogenic development not only for some cell lines such as erythrocytes and mesenchymal cells but also for ovarian follicles.

## REFERENCES

- ARON, M., ARON, C. L'atrésie folliculaire déterminisme et signification. *Arch Anat Histol Embryol*, n. 36, p. 69-86, 1953.
- DEVAINE, M. *Contribution radiobiologique a l'étude de l'ovaire*. These Vaillant-Carmanne, 388 p. Thesis Ed. Liège, 1940.
- KAZANSKI, B. Trudi Laboratorii Osnov Ribovosto, Leningradski Universitet imm AA Jdanova, v. 2, p. 64-120, 1949.
- MARZA, V., ARATEI, H. *Biomorfologia cordicalei ovariene la mamiferø*. Bucuresti: Acad., 1972. 160 p.
- SINCAI, M., BOTAREL, S., TOMESCU, E. et al. The role of ovary epithelium in forming ovary follicles in mammalia and birds. *Lucr st I A T*, v. 1, p. 113-115, 1982.
- SINCAI, M., BOTAREL, S. Observation about ovarian folliculogenesis in *Gallus domesticus*. *Lucr st I A T*, v. XXI, p. 57-59, 1986.
- WINIWARTER, H., SAINMONT, G. Nouvelles recherches sur l'ovogenèse et l'organogenèse de l'ovaire des Mammifères (chat). *Arch Biol*, v. 24, p. 1-142; 165-276; 373-431; 627-651, 1909.
- ZUCKERMAN, S., MANOL, S., EKSTEIN, P. *The ovary* London: Acad. Pres., 1978.