Reproductive Biology and Endocrinology

Debate

Germline stem cells in the postnatal mammalian ovary: A phenomenon of prosimian primates and mice?

Evelyn E Telfer*

Address: Institute of Cell and Molecular Biology, University of Edinburgh, The Darwin Building Mayfield Road, Edinburgh EH9 3JR, United Kingdom

Email: Evelyn E Telfer* - Evelyn.Telfer@ed.ac.uk

* Corresponding author

Published: 18 May 2004

Reproductive Biology and Endocrinology 2004, **2**:24

Received: 15 April 2004
Accepted: 18 May 2004

This article is available from: http://www.rbej.com/content/2/1/24

The paper by Johnson et al. "Germ line stem cells and follicular renewal in the postnatal mammalian ovary" published in Nature on the 11th of March [1] suggests that a population of germ line stem cells exist within the adult mouse ovary and that oocyte numbers are regulated by a balance of activation of these cells and cell death. This paper should be viewed in its historical context as it re-ignites a debate that was thought to have been settled in the 1950s but one in which exceptions to the accepted dogma have previously been found.

Whether or not germ cells were fixed early in life or capable of continuing formation in adult life was a debate that was raised in the 1920's. In the 1920s the general view was that the oocyte supply was fixed [2] but this was challenged by Allen in 1923 [3] who believed he had evidence to support the theory that the formation of oocytes continued throughout reproductive life. It was proposed that cyclical proliferation of the germinal epithelium gave rise to oocytes [3-5]. This was a widely held view until the 1950s when Zuckerman (1951) [6] showed by extensive studies based on differential counting of follicles that oocytes were not produced throughout the life-span in most mammals. Further evidence using tritiated thymidine labelling of oocyte nuclei supported the view that juvenile and adult ovaries are direct descendants of the fetal germ cells and that germ cells do not increase in number throughout life [7-9]. Since these experiments the view that the oocyte population is fixed has been supported by numerous studies that have monitored proliferation of somatic cells throughout ovarian development in several mammalian species with none reporting signs of proliferation of putative germ cells. However, exceptions to this have previously been found in mammals; in some species of prosimian primates (*Loris tardigradus lydekkerianus* and *Nycticebus coucang*), the most ancient of primate families, mitotically active germ cells have been found in adult ovaries [10,11]. These studies found that germ cells clustered in nests within the ovarian cortex incorporated tritiated thymidine. The question of whether any of these proliferating germ cells pass through follicular growth and ovulation remains unanswered and the original studies provided no evidence to suggest that they did. The Johnson et al. [1] paper follows in a long line of studies in this area and forces us to reassess long held beliefs. The mouse study may suggest that the prosimian primates are not the only mammals to exhibit this phenomenon but the presence of such cells in other mammalian species remains to be proven. If the dogma is to be debunked and a new one accepted, at least in the mouse, it is sure to be challenged and tested, as should all dogma. This is the way of science and scientists.

References

1. Johnson J, Canning J, Kaneko T, Pru JK, Tilly JL: **Germline stem cells and follicular renewal in the postnatal mammalian ovary.** *Nature* 2004, **428:**145-150.
2. Pearl R, Schoppe WE: **Studies on the physiology of reproduction in the domestic fowl.** *J Exp Zool* 1921, **34:**101-118.
3. Allen E: **Ovogenesis during sexual maturity.** *Am J Anat* 1923, **31:**439-481.
4. Evans HM, Swezy O: **Ovogenesis and the normal follicular cycle in adult mammalia.** *Mem Univ Calif* 1931, **9:**119-224.
5. Allen E, Creadick RN: **Ovogenesis during sexual maturity. The first stage, mitosis in the germinal epithelium, as shown by the colchicine technique.** *Anat Rec* 1937, **69:**191-195.
6. Zuckerman S: **The number of oocytes in the mature ovary.** *Recent Prog Horm Res* 1951, **6:**63-109.

7. Rudkin GT, Griech HA: **On the persistence of oocyte nuclei from fetus to maturity in the laboratory mouse.** *J Cell Biol* 1962, **12:**169-175.
8. Borum K: **Oogenesis in the mouse. A study of the origin of the mature ova.** *Exp Cell Res* 1967, **45:**39-47.
9. Peters H, Crone M: **DNA synthesis in oocytes of mammals.** *Arch Anat Microsc Morphol Exp* 1967, **56:**160-170.
10. Duke KL: **Ovogenetic activity of the fetal-type in the ovary of the adult slow loris, Nycticebus coucang.** *Folia Primatol (Basel)* 1967, **7:**150-154.
11. David GF, Anand Kumar TC, Baker TG: **Uptake of tritiated thymidine by primordial germinal cells in the ovaries of the adult slender loris.** *J Reprod Fertil* 1974, **41:**447-451.