



Female germline stem cells: A source for application in reproductive and regenerative medicine

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Abstract

Studies suggest a renewable source of eggs and stir more controversy, especially about the origin of female germline stem cells (FGSCs). It should be elucidated whether or not neo-oogenesis continues in the ovaries of mammalian female during postnatal life. Therefore, the establishment of FGSCs is very important for many applications. Here, using adult pig ovary, we isolate, identify, characterize FGSCs to elucidate their origin, then examined the proliferation, growth and differentiation of them. These cells were heterogeneous, depending on both of c-kit expression and cell size, and also express stem cell and germ cell markers. Importantly, we show clearly that the cells with the characteristics of early primordial germ cells are present in the adult pig ovary. Once FGSCs were established, they could be expanded in vitro for months without loss of the identifying markers and proliferative potential. Under appropriate conditions, the FGSCs differentiated into primordial oocyte-like cells and grow close to full-sized oocytes. These may assist in therapeutic strategies in human with their potential to make new oocytes and support ovarian function and fertility. Our results support the theory that the ovary contains a small number of undifferentiated cells with stem cell characteristics. These might remain in the postnatal and adult ovary and under certain conditions could resume mitosis, enter meiosis and give rise to oocytes. Given the existence of these FGSCs in mammalian ovaries and the depletion in ovarian reserve during female reproductive aging, one can hypothesize that such "neo-oogenesis" was present in ancestral forms, is still present in insects, some fish and mollusks, but has been lost in land vertebrates through evolution. FGSCs cannot proliferate in the ovary normally because of inhibitory factors, but under appropriate conditions, they can undergo proliferation and differentiation, and provide a potential mechanism for the self-renewal of germline stem cells.

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