

A first step in growing human primordial follicles *in vitro* to maturity in a multi-step culture system

Evelyn E Telfer

Institute of Cell Biology, The University of Edinburgh

The ability to produce functional human oocytes from the earliest follicular stages through to maturation and fertilisation *in vitro* could revolutionise fertility preservation practice. Indeed a major goal of regenerative medicine is to recapitulate the whole process of oogenesis *in vitro* starting from Primordial Germ Cells (PGCs) or even stem cells. This complete *in vitro* derivation and development of oocytes has been achieved in mouse where *in vitro* grown (IVG) oocytes from primordial follicles (and those derived from PGCs, Embryonic Stem (ES) Cells and induced pluripotent stem cells (iPSCs) have resulted in the production of developmentally competent oocytes capable of being fertilised and producing embryos leading to live offspring.

However, developing IVG systems to support complete development of human oocytes has been more challenging. The aim of our work is to determine whether complete oocyte development can be achieved from primordial follicles obtained from human ovarian tissue. We have developed a dynamic multi-step culture system that supports the activation of primordial follicles (step 1) growth of multilaminar follicles (step 2) and oocyte growth without the need to culture the whole follicle (step 3). Using this system a population of oocytes capable of reaching Metaphase II. This provides a starting point to determine whether IVG results in “normal” oocytes (McLaughlin et al, 2018).

This presentation will provide an update on progress in achieving the goal of growing human oocytes *in vitro* and focus on the requirements to improve quantity and quality of *in vitro* grown human oocytes. The differences between prepubertal and post pubertal tissue as well as the challenges of growing follicles from tissue that has been previously treated with chemotherapeutic drugs and tissue from gender re-assignment patients will also be covered.

Reference: M. McLaughlin , D.F. Albertini , W.H.B.Wallace , R.A.Anderson **E.E. Telfer**.(2018) Metaphase II oocytes from human unilaminar follicles grown in a multi-step culture system. *Molecular Human Reproduction* **24**:135-142