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Short Communication

# Reconstitution of an Ovarian Environment for Mouse and Human Oocytes Generation from Stem Cells

**Simon Jackson***

*Department of Reproductive Medicine, International Institute for Training and Research in Reproductive Health, India*

## INTRODUCTION

### Reconstitution of an ovarian environment for mouse and human oocytes generation from stem cells

Researchers from Kyushu University have succeeded in reconstructing components in the ovarian environment that are necessary for the production of mature egg cells using mouse stem cells. They were also able to use their discoveries to grow healthy mice and manufacture functional egg cells.

The researchers hope that by knowing the underlying reasons of infertility, they will be able to treat it and help save critically endangered animals by producing egg cells.

Understanding how a single cell with the potential to become anything may specialize into cells that make up an organ or tissue, a process known as 'differentiation,' is a key component of stem cell research. Professor Katsuhiko Hayashi of Kyushu University's Faculty of Medical Sciences has been researching the mechanisms that govern the formation and development of the oocyte, which is the most basic cell in the human body. The oocyte is the immature stage of the ovum, commonly known as an egg cell, according to Hayashi, the study's lead author. "Many significant advances have been made in our understanding of oocyte formation, including the generation of mouse and human oocytes from their respective stem cells and the breeding of healthy mice."

However, creating the correct support system to assist differentiate stem cells into oocytes is a key stumbling block in the process. Primary oocytes mature in the body with the help of other cells during puberty. The ovarian follicle is the collective aggregate that eventually generates a mature egg cell.

“While we were able to create mouse oocytes from stem cells, we needed to unite them with cells called gonadal somatic cells that were removed from mice in order for them to mature,” says first author Takashi Yoshino, an assistant professor at the Faculty of Medical Sciences.

"We must be able to build the support system from stem cells if we wish to better understand oocyte development and apply this technology to endangered animals and even people."

The team's initial step was to look at mice and figure out which genes and when they are produced that give rise to gonadal somatic cells. Following the discovery, they investigated mouse stem cells under various growing settings until they were able to develop cells with similar characteristics.

"Because these cells have the same genetic expression profiles as gonadal somatic cells, we term them foetal ovarian somatic cell–like cells, or FOSLCs. The next step was to combine the FOSLCs with the stem-cell-derived primordial germ cells oocyte precursors that we'd been producing in previous research to see if they matured into oocytes "Yoshino explains.

They were able to see the cells begin to form follicular structures around the oocytes after several days of growth. After confirming that these cells were fully formed oocytes, the eggs were fertilized and put into a surrogate mouse, where they successfully produced pups. The new approach is expected to make it possible to produce a large number of oocytes without having to take cells from the host animals.

"This will significantly help improve our understanding of ovarian follicle development and reproductive biology as a whole," explains Hayashi.

"The application on humans is technically feasible, but because of the genetic and epigenetic instability of in vitro made gametes, we still must carefully think and discuss the ethics and technology of its application. We will continue our work to further elucidate the mechanisms of this fundamental and unique extension of life."

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***Correspondence to:** Simon Jackson, Department of Reproductive Medicine, International Institute for Training and Research in Reproductive Health, India, E-mail: Jackson.simon@yahoomail.com

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