# In Vitro System for Ovarian Follicle Development

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## Technology description

Short Description

Compositions and methods to produce a gel of interpenetrating polymers of fibrin and alginate with properties optimized for the maturation of ovarian follicles in vitro.

Background

Currently, the only widely accepted method to preserve fertility for women with premature infertility due to cancer therapies is embryo cryopreservation. This avenue requires the patient to be of reproductive age, have a male partner with whom she would like to have children, and be able to delay cancer treatment long enough to complete an ovulation cycle. For patients unable to meet these criteria, options for fertility preservation are limited, but in vitro maturation and fertilization of ovarian follicles holds great promise. An ovarian follicle consists of an oocyte surrounded by layers of granulosa cells, a basement membrane composed of extracellular matrix, and an outer layer of theca cells. As follicles develop in vivo, the somatic cells surrounding the oocyte proliferate and differentiate, and the oocyte grows in preparation for ovulation and fertilization. As the follicle matures, it migrates from the cortex of the ovary to the medulla, thereby proceeding from a firmer to a softer environment. "Three-dimensional" culture of ovarian follicles in a supporting gel matrix maintains the morphology of the follicle and the cell-cell and cell-matrix interactions. However, gels made from a single material do not recapitulate the change in the mechanical environment experienced by the oocyte as it migrates.

Abstract

Researchers have developed novel matrices that address a need for improved methods for fertility preservation. Their biological matrices are interpenetrating networks (IPNs) which are a combination of polymers in a network form. One polymer is synthesized and/or cross-linked in the presence of the other, either simultaneously or sequentially. In this particular invention, the IPN consists of fibrin, a biomatrix with multiple ECM components and entrapped growth factors, and alginate, a relatively inert scaffold which does not interact with integrins of mammalian cells. These unique matrices provide both the dynamic cell responsive properties and the needed physical support to create an environment supportive of in vitro ovarian follicle culture. The fibrin softens the more rigid alginate and is degradable over time to accommodate the growth and expansion of cells.

## Application area

In vitro fertilization techniques (e.g., follicle culture system for female cancer patients)

Tool in fertility research

## Advantages

Produces a higher rate of meiotically competent follicles
Mimics the environment of the ovary
Provide fertility options for germline preservation for female cancer patients

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