In Vitro Spermatogenesis with Organ Culture Methods

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医学教育図書棟3階　第2講義室

ABSTRACT

Spermatogenesis is one of the most complex cell differentiation processes that takes more than one month in rodents and two months in humans. Thus, it has long been a challenge to recapitulate it under *in vitro* conditions.

Using a classical organ culture method, we successfully induced the differentiation of spermatogonial stem cells (SSCs) of mice up to sperm formation totally *in vitro*. The haploid cells produced in the culture condition were fertile sperm, capable of producing healthy and reproductively competent offspring by micro-insemination. It was also possible to cryopreserve fresh testis tissues for later spermatogenesis *in vitro*. In addition, not only SSCs innate to the cultured tissues, but SSCs from other sources could be introduced to the tissue by injection into the seminiferous tubules for culturing. The foreign SSCs underwent spermatogenesis in the host testis tissues in culture. Using Sl/Sl^{d} mutant mice as a model animal, we also demonstrated that certain types of spermatogenic failure could be rescued in culture. All these results demonstrated that the organ culture method using the classical gas-liquid interphase principle is a powerful tool for the study of spermatogenesis, and could be a modality for the treatment of male infertility in future. However, this culture method is only useful for mouse spermatogenesis so far, and there are several limitations. First, spermatogenesis is maintained *in vitro* for less than 2 months. Second, sperm production efficiency was quite low compared to production *in vivo*. We have been tackling these limitations by adopting a new microfluidic culture system. We produced devices conformed to organ culture of testis tissue. I also would like to present these recent results using the microfluidic devices.

The organ culture method could be improved further, which should be useful not only for the study of spermatogenesis but also for other tissues. Through continued refinements of the method, it will be applicable to other species including human, and may contribute in particular to the treatment of male infertility in future.

●Inviter: Prof. Ito (Dept. of Pathology & Experimental Medicine)／伊藤　隆明　教授（機能病理学）

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