

P-133: Automated vitrification and warming of oocytes mediated by a novel microfluidics device

Authors: Martin-Villalba T, Dosdá C, Fidalgo J, Garcia D, Cancio-Villalonga D, Carasa P, Álvarez-Argüelles S, Cortes S, Garcia De Miguel L, Criado E, Matthys L, Horcajadas JA, Munne S

1. Objective:

The purpose of this study is to develop a microfluidic device to automate the critical process of vitrification and thawing procedures, providing standardization, minimizing inter and intra-center variability, and reducing hands on time.

2. Design:

Experimental comparative study of both vitrification and warming of bovine and human oocytes using an automated microfluidics device (Davitri, Overture Life).

3. Materials and Methods:

A microfluidics system has been developed that infuses the solutions required in a central well, where the oocytes are placed, and withdraws the spent solutions. The system and the protocols were first tried in bovine oocytes, which are of similar size as human, and later on human donated oocytes. After 24 hours of maturation the cumulus oocyte complex (COCs) were denuded manually and vitrified using the palm-size Davitri device. The scripts controlling the process are based on the Kitazato protocol. Once the procedure was validated with bovine, frozen human oocytes from donors were warmed and vitrified automatically and fresh human oocytes were vitrified and warmed automatically.

4. Results:

100 fresh bovine oocytes were vitrified automatically and warmed manually, 5 of them were lost during the procedure and 84 oocytes survive after culture (88%), compared to 80% for a control group. Also 50 fresh bovine oocytes were vitrified manually and warmed with the microfluidics device, and 48 of them survived (96%).

Donated frozen human oocytes (N=19) were warmed automatically, and 12 survived (63.15%) compared to 80% expected (1,2). Those 12 were re-vitrified automatically and 71% survived thawing compared to 70% expected after re-vitrification (3).

After these promising results 4 fresh human mature oocytes from an egg donor were automatically vitrified and manually warmed of which 100% survived. Also, 13 fresh immature oocytes were automatically vitrified and manually warmed of which 11/13 (86.6%) survived.

5. Conclusions:

The automation of vitrification and thawing of eggs is an improvement in assisted reproduction by allowing constant high survival rates with reduced hands-on time. Here we provide proof of concept that the Davitri microfluidics device is able to vitrify and warm both bovine and human oocytes with high survival rates.