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## **Evaluation of the effects of a semi-automated vitrification performed before or after in vitro maturation (IVM) on the kinetic of oocyte maturation and chromosome segregation.**

Gaëlle Marteil, Chaput L, Sandra Dollet, Bruno Pereira, Eléonore Eymard-Pierre, Melanie Fiot, Charlène Gouhier, Anne Sophie Gremeau, Candice Chauffour, Andrei Tchirkov, et al.

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Category **Clinical science**

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Abstract title **Evaluation of the effects of a semi-automated vitrification performed before or after in vitro maturation (IVM) on the kinetic of oocyte maturation and chromosome segregation**

Biography **Gaëlle Marteil, PhD**

#### **EDUCATION**

**2010 PhD in Biology**

**2007 Master's degree in Biochemistry**

**2005 Bachelor's degree in Biology**

#### **RESEARCH EXPERIENCE**

**2018-Present Lecturer in human reproductive biology, IMoST UMR1240 Inserm/University Clermont Auvergne, France**

**2011 - 2018 Post-doctorate, CCR laboratory, Instituto Gulbenkian de Ciência (IGC), Portugal.**

**2007 - 2010 PhD Biology, Cell Cycle Team, UMR6061 CNRS- University of Rennes 1, France.**

#### **Last PUBLICATION**

**2018 G Marteil et al. Over-elongation of Centrioles in Cancer Promotes Centriole Amplification and Chromosome Missegregation. Nature Communications**

**G. Marteil<sup>1</sup>, L. Chaput<sup>2</sup>, S. Dollet<sup>1</sup>, B. Pereira<sup>3</sup>, E. Eymard-Pierre<sup>4</sup>, M. Fiot<sup>1</sup>, C. Gouhier<sup>2</sup>, A.S. Grémeau<sup>2</sup>, C. Chauffour<sup>2</sup>, A. Tchirkov<sup>4</sup>, F. Brugnon<sup>2</sup>.**

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#### **Study question:**

**What are the optimal vitrification method (semi-automated vs. manual)**

**and oocyte stage for *in vitro*-matured oocyte cryopreservation using meiosis kinetics and chromosome segregation as readouts?**

**Summary answer:**

**The semi-automated vitrification method does not impact oocyte nuclear maturation quality compared with the manual method. Immature oocyte cryopreservation should be performed after IVM.**

**What is known already:**

**Fertility preservation using oocyte vitrification should be performed before oncological treatments. The reference protocol consists in collecting mature oocytes after ovarian stimulation. Nevertheless, ovarian stimulation sometimes yields immature oocytes or cannot be performed (e.g., emergency oncological treatment). An IVM step is therefore required but it is not clearly demonstrated whether IVM should be performed before or after vitrification. Oocyte vitrification is usually performed with manual methods. A semi-automated vitrification device (Gavi®, Genea Biomedx) showing high performances for embryo was recently released. To our knowledge, no study has analysed its efficiency on oocyte vitrification.**

**Study design, size, duration:**

**200 immature oocytes collected from ICSI cycles from January 2020 will be used. Oocytes will be divided in five groups (40 oocytes/group): freshly matured oocytes (group 1 control), oocytes vitrified after IVM by a manual technique (group 2a) or by Gavi® (group 2b) and oocytes vitrified prior IVM (groups 3a and 3b). We assess oocyte nuclear maturation quality by evaluating IVM kinetics by time-lapse (Geri®) and the accuracy of homologous chromosomes segregation by CGH array.**

**Participants/materials, setting, methods:**

**Since January 2020, 124 out of 200 immature oocytes have been included for this study. These oocytes provide from women under 37 years old without ovulatory disorder after signing an informed consent. The kinetics of meiotic resumption (germinal vesicle breakdown (GVBD) and polar body extrusion (PBE) timings), is determined by time-lapse technology (Geri®, Genea Biomedx). The accuracy of the homologous chromosome segregation during the first meiotic division will be assessed by CGH-Array.**

**Main results and the role of chance:**

**The clinico-biological characteristics (age, BMI, smoking and total FSH dose) are comparable between the five groups ( $p > 0.05$ ). No significant difference in post-thawing oocyte survival rate is observed between the two vitrification methods (semi-automated 58% vs. manual 64%). A**

**significant difference in the overall oocyte survival rate is observed according to the stage of vitrification with a significantly higher survival rate if oocytes are vitrified at the mature stage (93% (2a+2b) vs. 61% (3a+3b),  $p = 0.02$ ). The IVM rate is significantly higher if oocytes are matured freshly (86% in group 1 (fresh IVM,  $n = 7$ ) and 93% in group 2a+2b (IVM before vitrification,  $n = 27$ )) compared to post vitrification (71% in group 3a+3b,  $n = 28$ ),  $p = 0.03$ . The vitrification technique does not seem to impact IVM rate since it reached 64% (group 3a,  $n = 11$ ) and 76% (group 3b,  $n = 16$ ) ( $p = 0.4$ ). GVBD and PBE timings are not significantly different between the 5 groups, suggesting that neither the oocyte stage of vitrification nor the vitrification technique affects maturation kinetics. Similarly, our preliminary results of polar bodies and oocytes chromosomal profiles assessed by CGH-Array demonstrate a similar rate of aneuploidy (monosomy or trisomy) between the groups.**

**Limitations, reasons for caution:**

**Our preliminary results of CGH array should be confirmed with the analysis of a larger number of IVM oocytes.**

**Wider implications of the findings:**

**Vitrification of immature oocytes should be performed by semi-automated or manual methods after IVM. To our knowledge, this is the first study comparing the efficiency of both semi-automated and manual vitrification methods on immature and in vitro-matured oocytes.**

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**I have no potential conflict of interest to disclose**

Keywords

**In vitro maturation  
fertility preservation  
oocyte vitrification  
nuclear maturation**