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Ciclo XXXIV Tutor: Prof.ssa Paola Piomboni

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Introduction:

The most important goal of reproductive medicine is to select a healthy embryo to aid infertility couples to get healthy babies. Predicting which embryo has the highest viability has been a major challenge for embryologists; morphological evaluation at different preimplantation stages is the predominant method for selecting viable embryos, but a good embryo morphology may not necessarily identify a chromosomally normal embryo with the best implantation potential. Consequently, several invasive and non-invasive approaches that overcome those handicaps, such as Preimplantation Genetic Screening (PGS) or morphokinetics evaluation of the embryo, which has been clinically implemented to try to predict the ability of an embryo to reach blastocyst stage or even to implant. Despite the improvement in success rates obtained when using these methods, none of them ensures implantation.

Over the last decade, developments of non-invasive embryo grading for the greatest viability has looked into metabolic, proteomic and genomic analysis of spent culture media; the analysis of multiple molecules could be the key in the search for predictive disease biomarkers, but they also provide tools for a deeper understanding of embryo implantation.

However, to date, there is no useful non-invasive molecular tool that can predict the ability of an embryo to implant, but the analysis of secreted molecules in embryo culture media is expected to complement the existing embryo selection techniques to provide a better predictive profile of embryo competence.

Methods:

- Nanoparticle Tracking Analysis;
- Direct Detect;
- Bioanalyzer;
- Bicinchoninic Acid Assay;
- Fluorescence-Activated Cell Sorting;
- Size-exclusion chromatography;
- Enzyme-Linked Immunosorbent Assay;

- DNA Extraction
- RNA Extraction;
- DNA quantification Assay (Qubit Assay);
- RNA quantification Assay (Qubit Assay);
- Droplet Digital PCR;
- Cholesterol Quantification Assay;
- Sphingomyelin Quantification Assay

Results:

Through the techniques listed above, the analysis of the spent culture media of the embryos collected during IVF cycles was deepened, performing more specific analyzes searching for potential biomarkers that can provide information on the state of health of the embryos themselves in a non-invasive way. The future goal is to improve the sensitivity and specificity of the techniques used and identify one or more molecules and methods that can provide this information that can be applied in the context of an Assisted Reproduction treatment.

Partecipazione a congressi e corsi:

- Emergenza COVID-19. Impatto sulla PMA e sul laboratorio: criopreservazione di gameti ed embrioni, Webinar BioCare Europe 3 Aprile 2020;
- Crioconservazione degli embrioni ai tempi del coronavirus, Webinar Centro Demetra 27 Aprile 2020;
- La percezione pubblica della scienza: i giovani ricercatori di fronte a temi scientifici di forte interesse pubblico, politico e mediatico, Webinar Centro UniStem Dipartimento di Bioscienze Università degli Studi di Milano 27-28 Aprile 2020;
- Che cos'è il protocollo Duostim e quando può essere usato, Webinar Centro Demetra 4 Maggio 2020;
- Recommendations for good practice for the use of time-lapse technology, Webinar ESHRE 11 Maggio 2020;
- COVID-19: Come si insegue e sconfigge un virus, Webinar Centro UniStem Dipartimento di Bioscienze Università degli Studi di Milano 28-29 Maggio 2020;
- The future of embryology. Technological advantages in embryo selection, Webinar IVF Meeting 9 Giugno 2020;
- ESHRE 2020 Virtual Congress, 5-8 Luglio 2020.

Pubblicazioni scientifiche:

- Laura Gambera, Anita Stendardi, Camilla Ghelardi, Benedetta Fineschi, Rosamaria Aini. *Effects of antioxidant treatment on seminal parameters in patients undergoing in vitro fertilization*. Archivio Italiano di Urologia e Andrologia 2019; 91, 3 2019.
- Laura Gambera, Anita Stendardi, Stefano Luisi, Benedetta Fineschi, Silvana Pizzasegale, Camilla Ghelardi, Rosamaria Aini Francesca Letizia Vellucci. *3 versus 6 oocytes in oocyte donors programs in Italy*. Reproductive BioMedicine Online, Submitted 2019, Accepted 2020.

Soggiorni in altri laboratori:

- Exosomics S.p.a. Strada del Petriccio e Belriguardo 35, 53100 Siena, Italy.