

NON-INVASIVE ASSESSMENT OF OOCYTES AND EMBRYOS: METABOLOMIC

I. Sánchez-Ribas

IVI Barcelona, Spain

A major issue in the human reproductive field, and one of the less studied, is the selection of appropriate embryos to transfer into the uterus. To date, the method used to select the best cleavage embryo or blastocyst has been morphological assessment, but this selection method is highly subjective and its modest predictive value and the intra and inter observer variability limits the potential of this technique. Therefore, selecting the best embryo to transfer, not only taking into account the "healthiest" embryo or the highest pregnancy outcome, but also the take-home baby rate is crucial in our reproductive clinics.

We know that the incidence of chromosomal abnormalities in human embryos is extremely high, and that a morphologically "good" embryo does not exclude these chromosomal abnormalities. Additionally, the embryo selection is performed by the genetic/chromosomal analysis of a PGD, an invasive method that consists in removing one/two cells of the embryo. Nevertheless we must not forget the negative impact of extracting one or two cells for the implantation ability and the true efficacy of this technique. The use of PGS is highly questioned nowadays, in fact the ASRM 2007 statement says that its use is unclear in order to achieve pregnancy in patients at risk for aneuploidy.

The ultimate goal to understand embryogenesis is the OMICS techniques. They are disciplines which study events and interactions of cellular structures and processes, from DNA to biological function, it means from genes to metabolites. All the processes which contribute to the phenotype happens through this complex system, and genomics, transcriptomics, proteomics and metabolomics try to understand how an embryo grows and what are the indicators of success. The latest research on proteomics, metabolomic and biomarkers are beginning to define metabolomic and proteomic profiles in order to find biomarkers of "healthy" oocyte, embryos, or implantation capability. The recent proteomic and metabolomic techniques have developed the quantitative and qualitative analysis of proteins and/or metabolites in one single cell, an organism or even a sample under different situations, with the aim of obtaining a comprehensive profile of all proteins and metabolites present. Low molecular weight metabolites represent the final products of the cellular metabolism and therefore reveal the response of the biological systems to a variety of genetic, nutritional and ambient conditions in different time points.

Nowadays, quantitative techniques for the assessment of the non invasive embryonic metabolism are developing quickly and are the objective of these researches to determine the predictive values of embryonic viability and pregnancy.

Our objective is to develop a pre-implantational non-invasive diagnosis. We aim to find a metabolomic profile that enables us to select normal embryos from the aneuploid embryos using the culture media where they are growing.

The fact that we could develop a novel non-invasive method to determine healthy and abnormal embryos should improve the chances of selecting the embryo with better reproductive and implantation rates. The complete non-invasive study of the embryo without invading it will improve the implantation rates due to the positive selection, highly improving the actual implantation rates generalizing this kind of study to all IVF couples.

The traditional evaluation method for assessing embryos has limited capability to select those with developmental potential. There is a clear need to improve our routine work, with higher pregnancy rate and lower risk for multiple gestation rate. Currently, there are new technologies under study to achieve these goals, and these techniques may become in future a useful tool to assess embryo selection and also they could be a way to expand our knowledge of embryo physiology in order to increase ART efficiency.