

## **ASSESSMENT OF OOCYTE AND EMBRYO VIABILITY USING NON-INVASIVE METABOLOMIC PROFILING OF EMBRYO CULTURE MEDIA**

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IVF is largely governed by two opposing results (Failure and Success). Failure is observed in up to 85% of the embryos we transfer, while success is sometimes paid dearly by the high multiple pregnancy rates caused by in-vitro fertilization (IVF). Both these outcomes can cost the individual patient immensely. Although less common, the most feared complication after IVF treatment is that of a multiple pregnancy which often leads to a higher incidence of medical, perinatal and neonatal complications and hence to higher health care costs.

Single embryo transfer (SET) is an effective way to minimize the risks of multiple pregnancies. Because only one embryo is transferred, the selection of the embryo with an optimum implantation potential is of great importance. The selection of which embryo to transfer is currently based largely on morphological characteristics. In addition to morphology it has long been known that the intrinsic metabolism of a particular embryo can also provide strong clues to whether a particular embryo will be viable. Recently, a number of new technologies have examined the question of embryo viability assessment using both invasive and non-invasive procedures. The technology which allows us to examine the metabolites present in the culture media surrounding a developing embryo is based on the concept of combining bioinformatics and "Metabolomics".

The development of a rapid non-invasive screening technology using near infrared (NIR) spectroscopy of culture media has allowed us to establish a metabolic profile for individual embryos expressed as a "Viability Index". Total analysis time for obtaining the NIR spectra is <1 min per sample. Biomarkers indicative of viability are identified by examining the NIR spectra of the negative and positive FCA outcome groups. Partial Least Squares, a Multivariate Regression, proprietary bioinformatics and leave-one out cross-validation are used to develop a predictive algorithm that generates the "Viability Index".

To ascertain the benefits of using the Viability index we have developed models for the calculation of the Viability Index for embryos transferred on cleavage days 2 and 3 and at the blastocyst stage on day 5. Data will be shown on blind validation of these models whereby the Viability Index of single embryo transfer embryos has been correlated to the reproductive potential of the embryo transferred. The successful blinded non-invasive prediction of embryo potential indicates that the viability index can be used as a successful adjunct to morphology and as an aid in the rapid non-invasive prediction of pregnancy.