THE USE OF OXYGEN CONSUMPTION FOR OOCYTE AND EMBRYO SELECTION

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The ability to identify the most viable embryo is of fundamental importance and there is a need for more accurate oocyte and embryo selection in human assisted reproduction. Nevertheless oocyte and embryo quality evaluation is based on the morphology and kynetics linked to arbitrary selected times. These primary procedures to select gametes and embryos are subjective, limited and needs external manipulation and is quite possible that a large proportion of the failed implantations must be ascribed to the embryo. In consequence novel procedures are necessary to improve assessment of oocyte and embryo quality, and this is particularly important in IVF treatments to achieve a successful pregnancy. The technological advances in hi-tech research have enabled non-invasive determination of proteomic and metabolic status of the embryo.

Oxygen consumption measurements from oocytes and embryos could be applied routinely in the clinical embryology laboratory in order to assess quality, complementing the classical microscope based methods to select embryos. The use of this automated clinical and research instrument with programmable measurement cycles for unattended operation, would allow data to be collected on respiration rates of single oocytes and embryos before fertilization and during embryo development. Also the technology here presented is able to take measurements of embryonic development by analysing time-lapse images in real time to quantify the timing of cell division.

To our knowledge there is still no report of a successful application of these technologies in a human clinical setting in a blinded manner to evaluate any correlation between metabolic activity and the implantation potential of embryos that have been transferred. In this study we employ an automated oxygen respiration rate measurement using oxygen microsensors to characterize human oocytes and embryos after ICSI until transfer. The ongoing project is based in a prospective cohort observational study on infertile couples in which we are measuring the oocyte and embryonic respiration and these values are correlated with embryo viability and implantation those transferred embryos but always following the standard morphological criteria currently used by clinical embryologist.

The parameters studied have been postulated like new markers of embryo implantation and in consequence we will be able to:

1. Introduce a novel quantitative method to measure oocyte quality (actually this determination is based in subjective morphological features).
2. Substitute the standard procedures to select embryos for transference following exclusively morphological criteria by those automatic which combine morphology and respirometry.

Respiration rates from individual embryos by a non-invasive measurements is revealing important changes in the respiration patterns related to embryo fertilization and cleavage and with the ability to identify optimal embryos. Oxygen nanosensor technology, applied to embryo selection, could improve implantation rates in the future decreasing embryo manipulation (strictly necessary for the standard procedures) which considerably alters in vitro culture conditions. Also the future application of a new embryo selection method could increase chances of implantation success. The full automatic process here presented is providing dynamic observation for better decision by constant surveillance of all embryos, doing undisturbed culture in stable environment obtaining finally a flexible evaluation.