Autumn 2023

Optics & Photonics Group Lunchtime Seminar Series

University of Nottingham

Microrheology with optical tweezers: Measuring the viscosity of the embryo and the oocyte and its relationship with IVF success

Carl Campugan

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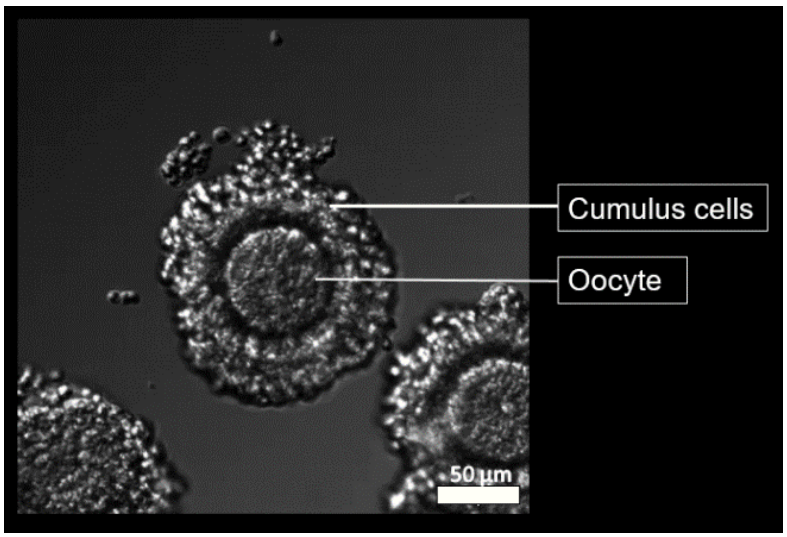

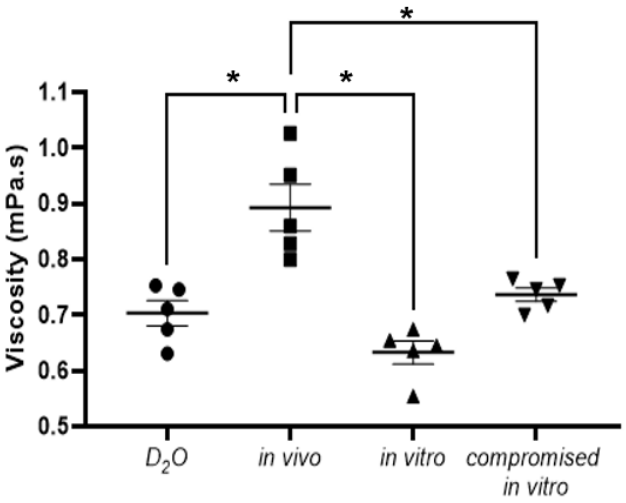

13:30 Thursday 30 November 2023

Pyschology Building - A1

OPTICS & PHOTONICS
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Carl Campugan

Microrheology with optical tweezers: Measuring the viscosity of the embryo and the oocyte and its relationship with IVF success

Biophotonics has revolutionized our understanding of biological phenomena through optical approaches, most prominently through imaging. However, optical approaches can also function as diagnostic probes for the accurate characterization of complex biomechanical processes. Optical tweezers exemplify this point. They use a tightly focused beam of light to trap microscopic-sized particles or cells in 3D which then act as localized probes for quantifying distances or forces at nanometre or piconewton precision. In various scientific disciplines, the mechanobiology of a cell can be indicative of its health and functioning and optical tweezers have reliably investigated this relationship in the study of red blood cells and molecular motors. Alternatively, optical tweezers are also powerful routes for the measurement of fluid viscosity . In the field of reproduction, there is a burgeoning need to understand how native cell properties of the gametes, embryo, or the properties of its surrounding environment before and during in vitro fertilisation (IVF) may be used to predict which embryos are best-suited for implantation post-IVF. The quality of an oocyte and the embryo is a crucial factor which influences several outcomes, including embryo developmental competence, pregnancy, and subsequent fetal development. My research explores the potential for application of the optical tweezers as a means to measure the viscosity of the cumulus matrix following maturation in a non-invasive manner. In particular, I am interested in determining whether the viscosity of the cumulus matrix differs between eggs of varying qualities and whether the differences in viscosity are reflective of embryo developmental competence and implantation success. I am also interested in measuring the matrix surrounding the embryo and whether it changes during development and how in vitro practices may compromise this prior to maternal implantation. Measurements will be performed using a trapped micron-sized particle probe. The present work aims to underscore the potential of the optical tweezers as a contemporary tool for reproductive success.

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All are welcome

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