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Encoded microparticles for isolated cell and embryo tracking

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Diverse types of barcodes have been designed in order to track living cells in vivo or in vitro, but none of them can follow an individual cell up to ten or more days. Until now, codes have been envisaged to follow different
cell subpopulations mixed in the same culture, to track a minority group of cells representing the whole population or to follow a subpopulation of cells in vivo.
Individual cell tracking is important to evaluate individual cell behavior (cell survival, cell movement, relationship with other cells, etc.) under different conditions (exposure to toxic gases or compounds, therapeutic drugs, source of light, a chemical stimulus, etc.). Individual cell tracking is also of great interest in embryo traceability in assisted reproduction technologies (ART) to make sure that the embryo to be transferred belongs to the right couple.
A biocompatible and non-cytotoxic encoded microparticle has been developed to track isolated cells or embryos. It is an useful tool in research to follow the behavior of individual cells exposed to different conditions or different therapeutic drugs and in clinical settings to track individual oocytes and embryo as well. We are seeking a company partner to further develop the technology through a co-development and license agreement.

The invention

A biocompatible and non-cytotoxic encoded microparticle for labeling or tracking an isolated cell (e.g. macrophages, fibroblasts, ESC or oocytes) or an isolated embryo has been developed. The microparticle is made of a biocompatible material using silicon microtechnologies. This technology allows the production of thousands of barcodes containing different codes. Its external shape comprises a code by which it can be identified using an inverted optical microscope with an objective between 20X - 100X. Its dimensions are small enough that it can be introduced into or attached to isolated cells or embryos.
Contrary to previous labeling and tracking devices, the code of the microparticle is comprised in its external shape. The code of the particle may thus be considered a spatial code. There is no need for fluorochromes to be able to identify the code.

Innovative aspects and applications

- Encoded microparticules as a High throughput screening cells tool.
- Encoded microparticules for tracking human embryo in IVF treatment.
- Biocompatible and no cytotoxicity.
- Adherence to zona pellucida or plasma membrane .

- Optical microscopy code identification.
- Low-cost manufacture and high versatility.

State of development

- Barcodes have been tested in cells (macrophages) and in mouse embryos.
- Studies of Biocompatibility and cytotoxity have been carried out in macrophages and mouse embryos (during the pre-implantation development, from zygote to hatching stage).
- Barcodes are made using silicon microtechnologies (MEMs and NEMs fabrication) which allow the production of the devices with dimensions in the micron range.

Ongoing research

- Adherence to plasma membrane. Results are expected at the end of the second quarter of the year.
- In vivo studies in mouse. Results are expected within the last quarter of the year.

Intellectual property	Collaboration type
☑ Patent Application (PCT)	☑ Exclusive license agreement
☑ Publication Number: WO 2010/112530 (A2)	☐ Non-exclusive license agreement
☑ Filling date: 30/03/10	☐ Joint Venture agreement
☑ Patent Status: Applied	☐ Codevelopment agreement
☐ COPYRIGHT	☐ Manufacturing agreement
☐ KNOWHOW	☐ Distribution agreement
☐ TRADEMARK	☐ Other
☐ Other	

Technology codes

6.1. Medicine, Human Health

Keywords

IVF treatment, human embryo, cell tracking,

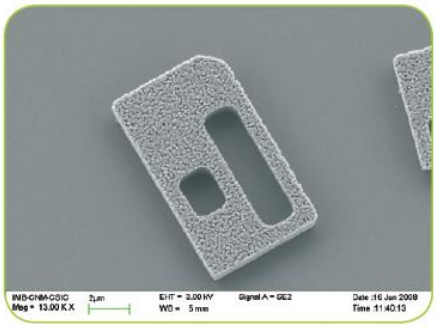

Fig. 1. A scanning electron microscope image of a barcode.

Fig. 2. Light microscope micrograph of an in vitro cultured macrophage cell with polysilicon barcode. Picture

was taken with a 40x objective on an inverted optical microscope

Fig. 3. Light microscope micrograph of a mouse embryo at the two-cell stage with different polysilicon barcodes adhered to the zona pellucida. Picture was taken with a 20x objective on in inverted optical microscope.