

## Scientific and Clinical Advances Group

### Summary of October horizon scanning questionnaire from the HHSEP

#### Annex B

#### Responses from experts relating to gametes

- Improvement on the freezing protocols for oocytes, will require analysis for abnormalities following fertilisation including chromosomal abnormalities. [REDACTED]
- Germ cell development *in vitro* [REDACTED]
- Generation of germ cells from embryonic stem cells [REDACTED]
- Ooplasm/ mitochondrial exchange [REDACTED]
- Gender separation of spermatozoa by fluorescence activated cell sorting (FACS). [REDACTED]
- Derivation of oocytes from mouse embryonic stem cells (~10 years) (several groups are trying to reproduce experiments of such oocyte production from ES cells. If we could produce oocyte-like cells from human ES cells, which could at least develop to the blastocyst stage, there would be an unlimited supply of oocyte-like cells to reprogram somatic cells and derive ES cells by using the somatic cell nuclear transfer to produce stem cells that have the identical genetic make-up as the patient. Without this it would be very difficult to supply enough oocytes for this technique to be possible.
- *In vitro* sperm maturation (5 years) [REDACTED]
- Germ cell transplantation (~3- 5 years) [REDACTED]

### Responses to experts relating to embryo development

- Controlling the differentiation of the cells within the cleaving embryo so as to maintain proliferation and gain large numbers of cells for potential embryo splitting [REDACTED]
- Making human chimaeras so as to have equivalent genetic contributions from two women (lesbian partners) [REDACTED]
- The impact of sub-optimal culture conditions on the health of individuals born to ART procedures [REDACTED]
- Embryonic stem cells and their insertion into the ICM of embryos to make desirable chimaeras, or their injection into anembryonic trophoblast vesicles to create multiple cloned vesicles to create multiple cloned embryos. [REDACTED]
- Improved ways of growing embryos and the use of automated culture methods (5 years) [REDACTED]

### Responses from experts regarding ethical issues

- Investigation and discussion about scientific perfection and health risk for the baby, and also how far such medical practice should be allowed and regulated. [REDACTED]
- The continued use of IVF to select for certain characteristics in the offspring, irrespective of infertility [REDACTED]

### Responses from experts regarding the use of IVM oocytes for treatment

- "I think this field is still immature and lacking enough data to allow clinical treatment." [REDACTED]
- "A promising technique, but still in the experimental, pre-clinical phase of development." [REDACTED]
- There is now a wealth of data and background information on IVM of bovine oocytes, including pregnancy rates and pregnancy failure rates after transfer of *in vitro* produced embryos to recipients." [REDACTED]

Continued.....

- “It is premature to introduce IVM of human oocytes clinically without adequate investigation using non-human primate models. One of the most resounding issues regarding this technology is imprinting and whether normal patterns will be retained with *in vitro* growth.” [REDACTED]
- “Knowledge of epigenetic influences on oocyte development is insufficient to allow such embryos to be used for treatment. More basic research on signalling between somatic and germ cells and translational research on the optimisation of *in vitro* culture conditions for oocyte maturation is still required.” [REDACTED]
- “In vitro maturation rates and clinical success seems to be slowly increasing particularly considering the data that is made available through Danish clinics. ....A new approach with human IVM must be carefully considered, particularly in the light of imprinting disease studies in humans after IVF, which are mainly concerned with a dysfunction of maternal allele modification. IVM may increase the rates of these very rare diseases.” [REDACTED]
- “...despite the fact that several pregnancies resulting from IVM have been reported, progress has been slow in developing and optimizing techniques for human application (and for that matter also for domestic species). The underlying problem is still our incomplete knowledge of how the oocyte acquires developmental competence during its growth within the follicle. The culture systems that have been developed to support the development of immature oocytes have benefited from increasing knowledge of at least some of the endocrine/autocrine/paracrine factors involved. But only when we have a more in-depth/comprehensive understanding of what is required during development to make a viable oocyte, will we perhaps be able to develop in-vitro culture systems for routine clinical application.” [REDACTED]
- “As with any new technique outcome should be carefully monitored. More prolonged in vitro culture warrants further experimental study.” [REDACTED]
- “*In vitro* maturation of oocytes is clearly necessary in any valid ART program.” [REDACTED]