

## 12.3.13.1 OOCYTE CRYOPRESERVATION

### Background

Human sperm and embryos have been routinely cryopreserved in conjunction with Assisted Reproductive Technology programmes since the first birth from frozen - thawed human sperm was reported in 1953 and the first pregnancy after cryopreservation of a human embryo was reported in 1983. Successful cryopreservation of human oocytes has proved more difficult. Because of their size and unique structural characteristics oocytes are more susceptible to damage during freezing than sperm or embryos.

The first pregnancy originating from a frozen – thawed and fertilized human oocyte was reported in 1986 which was soon followed by the first live birth reported in 1987. Oocyte freezing however, has until recently been relatively unsuccessful. The early results were variable with only 5 children born from 1987 – 1995.

Research from Melbourne by Debra Gook and colleagues in the 1990s showed that cryopreservation was not as detrimental to oocytes as was previously thought and that using ICSI (see sheet 12.3.8) provided better fertilization rates than insemination using conventional IVF (see sheet 12.3.5).

Around the turn of the century modified protocols were developed that improved survival and fertilization rates and as a result interest in oocyte cryopreservation increased and currently around 200 babies have been born. Oocyte cryopreservation is now being offered in conjunction with Assisted Reproductive Technology programmes in the USA, Europe, Asia and Australia. Recently two children have been born in Australia, the first in 2005 at Repomed in Adelaide and the second in 2006 from Melbourne IVF.

### Who might benefit from oocyte cryopreservation?

Oocyte freezing has been used in the following situations:

- ◆ Fertility preservation before chemotherapy or radiation therapy
- ◆ Oocyte donation
- ◆ Religious or moral objection to freezing embryos
- ◆ Male partner unable to produce a semen sample at the time of oocyte retrieval, or after failed epididymal aspiration and testicular biopsy
- ◆ Fertility preservation in young women.

### Effectiveness of Oocyte Cryopreservation

When assessing the effectiveness of oocyte freezing the oocyte survival rate, the fertilization rate (ie the number of oocytes that fertilize) and the pregnancy rates are important considerations.

From recent research the reported **survival of oocytes after freezing** ranges from 37% to 97%, with an average around 60%.

### 12.3.13.2 OOCYTE CRYOPRESERVATION

**Fertilization rates** range from 45% to 87% with an average of 66%, which is similar to routine IVF / ICSI fertilization rates which are generally around 70%.

**Pregnancy rates** per oocyte collection procedure are reported to be around 11% - 15% and pregnancy rates from cycles where embryos were transferred ranged from 12% to 58%. It should be noted that the pregnancy rate per oocyte frozen is much lower and rarely reported.

#### Children Born After Oocyte Cryopreservation

Although it has been estimated that around 200 children have been born following oocyte cryopreservation very little pregnancy outcome or follow-up information has been reported. The studies that have reported pregnancy outcomes have been sporadic and on low numbers of children. A study published in 1998 reported on 6 births, 5 girls and 1 boy who were all healthy. A year later the same group reported on 11 healthy births. No other details were given. A study from Spain reported five births from four pregnancies, three boys and two girls. All children were healthy and had normal chromosome results.

In 2004 a study reported on 13 births. In this study 8 were girls and 5 were boys, the birth weight was  $3.19 \pm 0.62$  kg. Chromosome analysis was normal for all children and no abnormalities were reported.

A Japanese study reported on the births of seven children. All were reported to be healthy but no other information was provided. Another study in 2001 reported on the birth of 16 children, 15 were healthy and one had a ventricular septal defect. In 2005 the birth of 5 children was reported and no abnormalities were observed.

The most recent study reported on the birth of 13 children (9 female and 4 male). The average length of pregnancy was 37.1 weeks and the average birth weight was 2.807kg. The chromosomes and six month follow-up on all children were normal. Although this study reported a relatively high miscarriage rate in the frozen oocyte group (33%) it was not statistically different from the fresh oocytes (19%).

#### Limitations of oocyte cryopreservation

- ◆ There is no guarantee that frozen oocytes will survive the freezing process or that a pregnancy will result from oocytes that have been cryopreserved
- ◆ It might be necessary to undergo more than one oocyte retrieval procedure
- ◆ Because freezing may cause the outside shell of the oocyte to harden the ICSI procedure is required for better fertilization and embryo development.
- ◆ There is limited information available on birth outcomes.
- ◆ It will not be possible to use the oocytes in an IVF treatment cycle unless the *Human Reproductive Technology Act 1991* eligibility criteria are met (Section 23). Specifically, an IVF treatment cycle can only be carried out when a couple, or woman, are unable to conceive for medical reasons and where the reason for the infertility is not age.

### 12.3.13.3 OOCYTE CRYOPRESERVATION

#### Management of oocyte cryopreservation at Concept Fertility Centre

Before freezing oocytes all women will need to undergo a blood test for HIV, Hepatitis B and Hepatitis C and sign a request form for cryopreservation and storage of oocytes.

This consent will last for 5 years up to a maximum of 15 years. Special applications will be required to extend storage beyond 15 years.

If storage of cryopreserved oocytes is no longer required they can be donated to another couple or allowed to succumb.

Under the *Human Reproductive Technology Act*, Concept cannot knowingly allow the use of stored oocytes posthumously. In the event of a woman's death, Concept will need to be informed so that decisions can be made regarding the continued storage of the oocytes.

#### An oocyte cryopreservation cycle involves the following steps:

- ◆ Referral to a Concept Fertility Centre fertility specialist to assess suitability
- ◆ Meeting with Concept Fertility Centre Scientific Director, Nurse Coordinator and Counselor
- ◆ Taking medication to stimulate the ovaries to mature several (10-15) oocytes (see sheet 12.1.4).
- ◆ For information on the risks associated with the medication please see sheet 12.1.10 "Risks and Side Effects with Drug Treatments and Surgery Associated with Assisted Reproductive Technology (ART)"
- ◆ Oocyte collection (see sheet 12.3.5 "IVF")
- ◆ Oocyte freezing
- ◆ Oocyte thawing, ICSI and embryo culture
- ◆ Embryo transfer

If you require more information or have any questions relating to oocyte cryopreservation please contact the Scientific Director at Concept Fertility Centre on 08 9382 2388.