



Background

Human sperm and embryos have been routinely cryopreserved in conjunction with Assisted Reproductive Technology (ART) 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 eggs (known as oocytes) has proved more difficult. Because of their size and unique structural characteristics oocytes are considered 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 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 it is now considered routine practice.

Oocyte cryopreservation is now being offered in conjunction with ART programmes in the USA, Europe, Asia and Australia.

Who might benefit from oocyte freezing?

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.

Methods used to freeze oocytes

Vitrification is the technique used to freeze eggs and embryos. Vitrification is very rapid freezing (only seconds) which causes the freezing media to become solid like glass which avoids crystallization which can be detrimental. Concept started using vitrification in September 2008.

Effectiveness of Oocyte Freezing

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 80%-90%.

Steps involved in egg freezing

- A meeting with Concept staff to discuss the egg freezing requirements
- Medication is taken to stimulate the ovaries to mature several (10-15) eggs
- Egg collection in theatre
- Eggs are frozen in small plastic straws
- When needed eggs are thawed
- Eggs are fertilized using the ICSI procedure
- Embryos are grown in the laboratory
- An embryo is transferred to the uterus
- Any excess embryos can be frozen
- Pregnancy test

Fertilization rates range from 50% to 80% which is similar to routine IVF / ICSI fertilization rates which are generally around 70%. Approximately 80-90% of fertilized eggs develop into embryos.

Pregnancy rates from cycles where embryos were transferred ranged from 20-35%. It should be noted that the pregnancy rates are lower for women over 35 years of age and pregnancy is unlikely in women over 40 years. The chance of pregnancy per oocyte frozen is much lower ranging between 5 -10% depending on age.

Children Born After Oocyte Cryopreservation

In 2009 an extensive review of oocyte freezing birth outcomes from 1986 to 2008 was published. Over 900 children have been born following oocyte freezing. Of the 900 births, 1.3% were noted to have an abnormality. This was not different to the frequency of abnormalities reported in naturally conceived children.

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 be harder 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/woman, are unable to conceive for medical reasons and where the reason for the infertility is not age.

Management of oocyte freezing 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 person or allowed to succumb.

Under the *Human Reproductive Technology Act 1991*, 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.
- Meetings with Nurse Coordinator and Counsellor.
- 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 (Frozen oocyte transfer).
- Freezing of excess embryos.

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

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