IVF: PAST, PRESENT AND FUTURE

Mark Larman
Chief Scientific Officer
HISTORY OF IVF

- IVF first achieved with rabbits in 1959
- IVF with human gametes - pioneered by Robert Edwards and Patrick Steptoe during the 1960s and 1970s
- On July 25, 1978, the first baby was born through in vitro fertilisation – Louise Brown
- In 2010, Robert Edwards was awarded the Nobel Prize in Medicine "for the development of in vitro fertilisation"
>8 million IVF children
CAUSES OF INFERTILITY

- Male Factors: 34%
- Female Factors: 27%
- Combined male and female: 9%
- Unexplained: 30%
IVF PRESENT-THE PROCESS

HORMONE TREATMENT

Increase the number of retrievable eggs

DAY 0
- OOCYTE RETRIEVAL
- SPERM PREPARATION
- FERTILISATION
- CULTURE

DAY 1-5
- EVALUATION

DAY 3-5
- EMBRYO TRANSFER
- CRYOPRESERVATION

Vitrolife
The oocytes are retrieved from the woman by using an ultrasound-guided needle to puncture the follicles and collect the oocytes. Thus, enabling fertilisation outside the body.
During sperm preparation, the most viable sperm cells are selected and supported. An optimal sperm preparation should result in a sufficient number of motile, morphologically normal and functional spermatozoa with maintained viability.
Sperm and oocytes are placed together in a dish with media. The sperm find their way to the oocyte and fertilisation takes place.

Sperm needs to be injected into the oocyte for fertilisation to take place.
During embryo culture, embryos are developing from 1-cell stage to the blastocyst stage.
Observe the embryos regularly and make accurate assessments while minimising disturbance to avoid stress.

Determine embryo genetic normality.
EMBRYO TRANSFER

Embryos are transferred into the uterus after 2-5 days of *in vitro* culture.
CRYOPRESERVATION

Cryopreservation enables good quality embryos to be cryopreserved for future use. The embryos are maintained in liquid nitrogen for long-term storage.

TWO METHODS

Slow freezing

Vitrification
SOCIAL EGG CRYOPRESERVATION
AGING EGGS AND CHROMOSOME ISSUES

Oocyte aneuploidy and maternal age

- Aneuploidy (%)
- Live birth (%)
- Miscarriage (%)

US CDC/SART data
ELECTIVE EGG FREEZING
IVF PRESENT-THE PROCESS

HORMONE TREATMENT

Increase the number of retrievable eggs

DAY 0

DAY 1-5

DAY 3-5
RAPIDVIT & RAPIDWARM OOCYTE

Specialised media for oocyte vitrification.
IVF FUTURE
HISTORY OF INNOVATIONS

1983 needle for new follicle aspiration technique
1994 commercial ICSI medium
1995 pharmaceutical grade IVF media
1998 **sequential media - G-1™/ G-2™ v. 2**
2001 media with recombinant human albumin
2002 media with hyaluronan - GIII Series™ v.3
2003 **implantation promoting medium for embryo transfer - EmbryoGlue®**
2004 V-tip aspiration needle for improved penetration
2005 ICSI solution with recombinant human albumin
2007 media with addition of antioxidant - G5 Series™
2008 small diameter aspiration needle with flow characteristics of a large diameter – Sense™ needle
2010 **closed vitrification system using super-cooled air - Rapid-i™**
2011 Yolk-free Sperm freeze medium
2012 **Primo Vision™**
2013 complete portfolio of IVF certified labware
2014 **G-TL™**
2015 EmbryoScope®
2016 MTG/Octax
2017 high patient capacity time-lapse system - EmbryoScope+
2018 **Gx-IVF, Gx-MOPS PLUS and Gx-TL (antioxidant combination media)**
IMPROVED OUTCOMES USING TIME-LAPSE

Frequently captured images of an embryo result in a video showing the development

Artificial intelligence/deep learning algorithms to create automated objective embryo assessment tools

**IMPROVED** implantation rate \(^1\)\(^-\)\(^4\)

**REDUCED** pregnancy loss \(^1\), \(^5\), \(^6\)

**SHORTENED** time to pregnancy \(^1\)

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Noninferiority, randomized, controlled trial comparing embryo development using media developed for sequential or undisturbed culture in a time-lapse setup

Thorir Hardarson, Ph.D., a Mona Bungum, Ph.D., b Joe Conaghan, Ph.D., c Marius Meintjes, Ph.D., d Samuel J. Chantilis, M.D., d Laszlo Molnar, Ph.D., e Kristina Gunnarsson, M.Sc., a and Matts Wikland, Ph.D. a

a Fertilitetscentrum, Carlanderska Hospital, Gothenburg, Sweden; b Reproductive Medicine Centre, Skåne University Hospital, Malmö, Sweden; c Pacific Fertility Center, San Francisco, California; d Frisco Institute for Reproductive Medicine, Dallas/Austin, Texas; and e MediBit Foundation, Budapest, Hungary
IVF MEDIA WITH 3 ANTIOXIDANTS

**Antioxidants improve mouse preimplantation embryo development and viability**

Thi T. Truong, Yu May Soh, and David K. Gardner*

School of BiOsciences, University of Melbourne, Parkville, Victoria, Australia

**Antioxidants improve IVF outcome and subsequent embryo development in the mouse**

T. Truong and D.K. Gardner*

School of BiOsciences, University of Melbourne, Parkville, Victoria, Australia
IVF FUTURE

- More consumables and equipment designed for IVF
- Continued improvement in embryo development and viability
- Objective embryo assessment
- Increase in genetic testing
- Improvement in implantation
- Increase in cryopreservation
- Increase in single embryo transfer

Reduce the time to pregnancy