

Mauro Fermariello/SPL

Above: Light micrograph of a human egg being injected with a single sperm

In vitro fertilisation

● To find out more about the ethical issues raised by the use of IVF and some of the other techniques described here read *Making Babies: Is There a Right to Have Children?* by Mary Warnock, who chaired the Human Fertilisation and Embryo Authority.

About one in six couples get help from specialists because they cannot conceive. One possibility is to use in vitro fertilisation (IVF). 'In vitro' means 'in glass' and refers to the fact that fertilisation takes place in a laboratory dish or test tube – hence the term 'test-tube babies'.

Box 1 ICSI

Intracytoplasmic sperm injection (ICSI) is useful for men who make very few good sperm. A woman's eggs are collected as in standard IVF. The man provides a sperm sample from which the healthiest sperm are extracted. If he does not release any good sperm they can be removed surgically from his testes. One sperm is injected into the centre of each egg. The best embryos are implanted in the uterus.

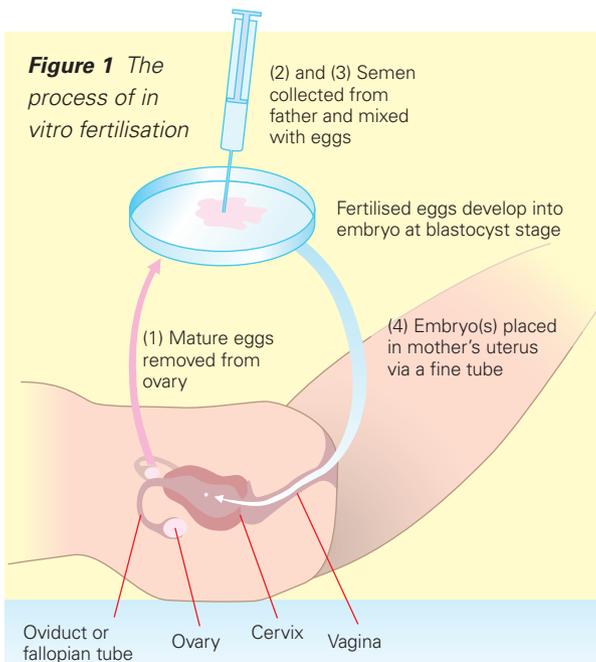
IVF has a success rate of only about 15%, but despite this low level of success several thousand babies are born in the UK each year as a result of IVF. Usually the woman takes fertility drugs or hormones to help her produce more eggs and the healthiest, most active sperm are selected from the man's sperm sample. The eggs are then harvested and fertilised in the laboratory. Fertilised eggs are implanted into the woman to develop naturally. Eggs, sperm and embryos can be frozen so the couple can have another child later, or for donation.

Standard method

A woman's eggs are collected when she ovulates. Eggs and sperm are mixed together in a culture dish. Any embryos that begin to develop are left to grow. They can be transferred to the woman's uterus 3 days after fertilisation, but leaving the embryos 2 more days until they become a **blastocyst** with up to 200 cells can improve the success rate. This is because only the good embryos will have passed through important

GCSE key words

Reproductive hormones
Genetics



(1) Collecting the eggs A thin needle-like probe is inserted into each ovary. Ultrasound images are used to guide the probe. Eggs from follicles are sucked into the probe. Alternatively, a **laparoscope** is passed through the abdomen wall and a fine, hollow needle is used to remove the eggs.

(2) Collecting the sperm The man is asked for a fresh sperm sample a few hours before it is needed. It is prepared by washing and spinning to sort out the most active, healthy sperm. If donated sperm are being used the sample is defrosted and prepared.

(3) Fertilising the eggs Sperm are mixed with the eggs in a culture fluid that will supply the cells' needs. Between 16 and 20 hours later the eggs are checked. Any that have not been fertilised or are abnormal are removed. The embryos are left a further 24 hours before being checked again. The embryos are implanted 2–5 days after the eggs were collected.

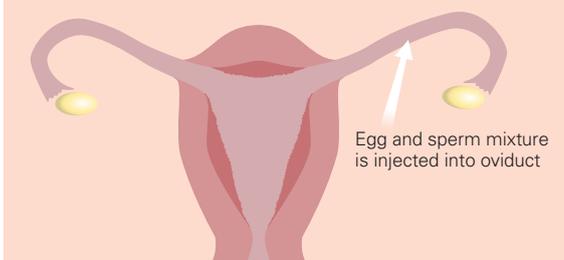
(4) Transferring the embryos One or two healthy embryos are chosen. A fine thin tube called a catheter is used to inject the embryos into the uterus through the cervix.

Box 2 GIFT

In gamete intra-fallopian transfer (GIFT)

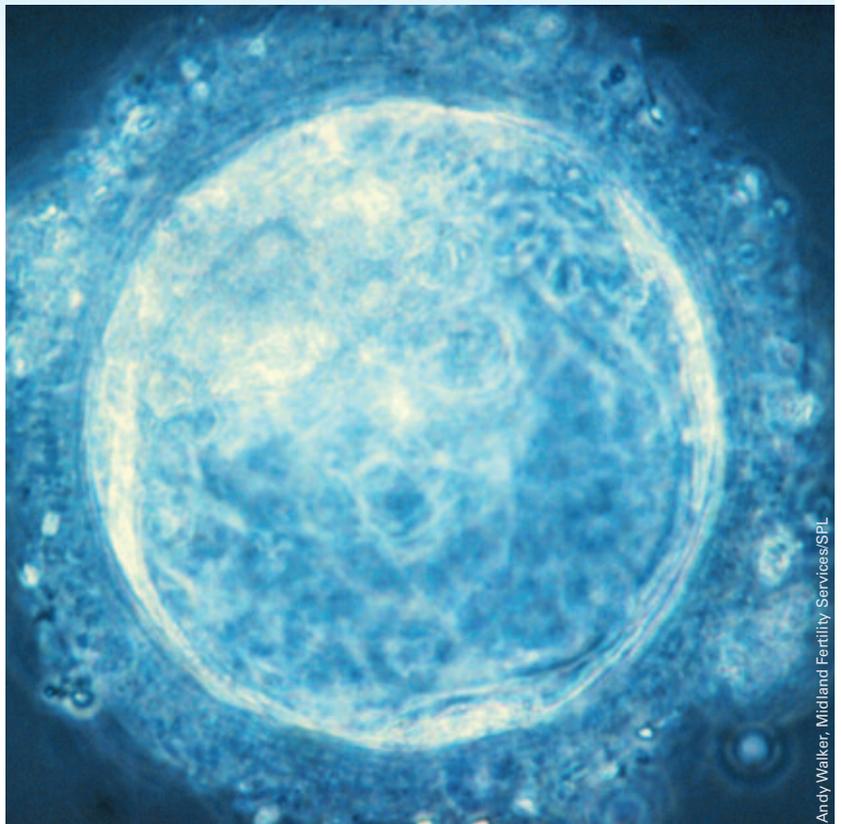
fertilisation takes place in the woman's oviduct, not in a culture dish. She must have at least one healthy oviduct for this method to work. The eggs and sperm are collected as in standard IVF and mixed together. The mixture is then injected into an oviduct (see Figure 2). The intention is to allow fertilisation and implantation to happen as they normally would.

Figure 2 The female reproductive tract showing the position of sperm/egg introduction for GIFT



growth and division processes successfully. These have a better chance of implanting. **Pre-implantation genetic diagnosis (PDG)** can be done at this stage (see 'For Debate: Embryo selection', pages 20–21 for more information about this).

The selected embryos (two, or at most three) are then transferred into the woman's womb. When an embryo implants in the uterus it has to break out, or 'hatch', from the **zona pellucida**, a gel-like layer around it. This layer may be tough, making it difficult for the embryo to break out. To prevent this problem a tiny hole can be made in the layer before the embryo is placed in the womb.



Box 3 IUI

Intrauterine insemination is fairly straightforward; fertilisation takes place inside the body.

The woman may need to take fertility drugs to stimulate ovulation. Egg development is tracked by ultrasound scans and when an egg is mature a hormone injection helps it to ripen and release.

A sample of sperm, from the father or donor, is inserted through the cervix into the uterus 36–40 hours later.

Above: A blastocyst. Within a few days a fertilised egg develops into a blastocyst, a ball of cells, that can implant in the uterus wall

● Check you know what the words gamete and fallopian tube refer to in GIFT.

Jane Taylor teaches biology and is an editor of CATALYST.