Test-tube Babies

Contents: Information and discussion questions on the problem of infertility and the technique of *in vitro* fertilization.

Time: 1—2 periods, depending on amount of discussion.

Intended use: GCSE Biology, Human Biology and Integrated Science. Links with work on human reproduction.

Aims:

- To complement and revise prior work on human reproduction
- To show the methods used to treat infertility, and the technique of *in vitro* fertilization
- To develop awareness of the benefits and some of the ethical problems associated with *in vitro* fertilization
- To encourage willingness to participate in group discussion, and to develop communication skills.

Requirements: Students' worksheets No. 206.

This unit is best used after the basic details of human reproduction have been covered. It is particularly useful for revision of work on reproduction.

The discussion questions are best tackled in groups of four or five, though teachers will appreciate that some students may be reluctant to participate because of their religious or cultural background.

Background information

This information may be useful when following up the discussion points.

1 *The Warnock Report** recommended that no human embryo be grown for longer than fourteen days outside the uterus. However, there was disagreement among members of the committee on the principle of embryo experiments, and on the length of time for which they should be permitted. Embryos grow more slowly in culture than they do in the uterus and so many scientists feel that it would be more appropriate to use a limit based on the stage of development rather than an absolute time limit. There is controversy among scientists themselves — some researchers see experimentation on human embryos as unnecessary, others as a vital procedure for the furthering of knowledge and clinical experitise.

2 A case occurred in Australia involving the frozen embryos of a wealthy couple. The wife had miscarried after the first *in vitro* fertilization and the couple were waiting to have another embryo implanted when they were both killed in an air crash. There were no close surviving relatives. The fate of the embryos — potential inheritors of a vast estate — caused a great deal of discussion. Suggestions included the destruction of the embryos, implanting them in a surrogate mother and allowing them to inherit, or allowing them to be adopted by new parents. Initially state officials accepted a recommendation that they should be destroyed but during the three months period left for further comment, the upper house of the Victoria State Parliament rejected this recommendation and left the way open for the two embryos to be adopted and implanted in a surrogate mother.

*Department of Health and Social Security, *Report of the Committee of Enquiry into Human Fertilization and Embryology.* Chairman: Dame Mary Warnock, DBE. HMSO, 1984, Cmnd 9314.

3 The possibility of making genetic changes *in vitro* raises many opportunities and issues. On the positive side, it might be possible to correct inherited genetic disorders, but students will no doubt be able to see many ghoulish possibilities on the negative side.

4 Artificial insemination and embryo implantation are common in livestock production. One technique for producing pedigree cattle involves giving a pedigree cow a 'fertility drug' to stimulate the production of several ova. The cow is then artificially inseminated with semen from a pedigree bull. The developing embryos are removed from the pedigree cow and implanted in the uterus of an ordinary cow, who thus gives birth to a pedigree calf.

Acknowledgements: Figure 1, London *Daily Mail.* Figures 2 and 3, reproduced from Graham Hill and John Holman, *Science* (Nelson).

TEST-TUBE BABIES

The first test-tube baby, Louise Brown, was born in 1978 amid great publicity. Behind the headlines is the unhappiness of many couples who are **infertile** and cannot produce a child of their own. 'Test-tube baby technology' now makes child-bearing possible again for infertile couples. But it also produces some tricky moral questions.

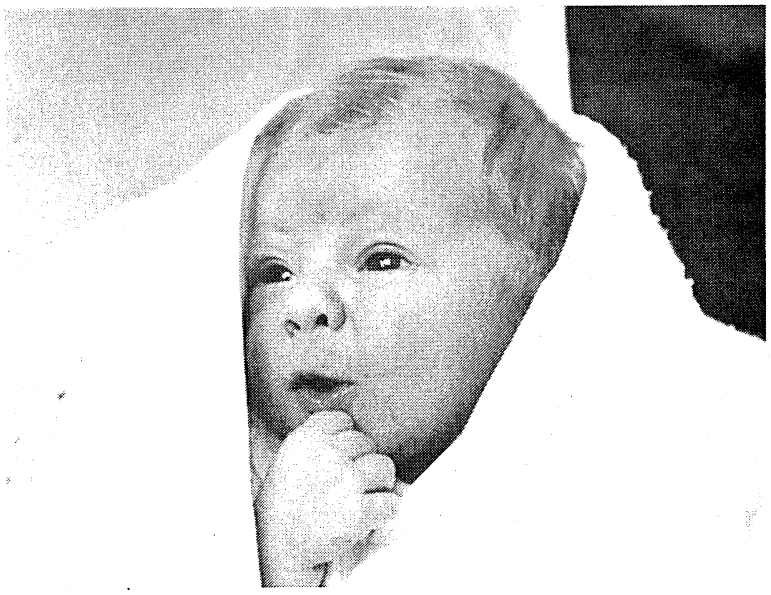

Figure 1 Louise Brown, the first test-tube baby

What causes infertility?

As many as one couple in ten has difficulty in starting or **conceiving** a baby. When 12 to 18 months have passed without a pregnancy occurring, most family doctors begin tests to find the cause of the infertility. There are many different causes. The investigations would probably go through four stages.

Stage 1 — Asking questions

The cause of infertility may lie with the man or with the woman.

The woman's menstrual history will be discussed. Does she have regular periods? If not, conception will be more difficult. The medical history of both partners will be examined. For example, if a man has had mumps since puberty he may be sterile and unable to make sperms. Questions will also be asked about the sexual activity of the couple. Some people have intercourse so rarely that conception is extremely unlikely! To give the best chances of an ovum and sperm meeting, it is best to have intercourse about the middle of the menstrual cycle.

Stage 2 — Simple examinations

The woman is given a simple examination. The doctor looks for any barrier to conception. For example, there might be a narrowing of the vagina, or a blockage cause by an infection of the vagina (see Figure 2).

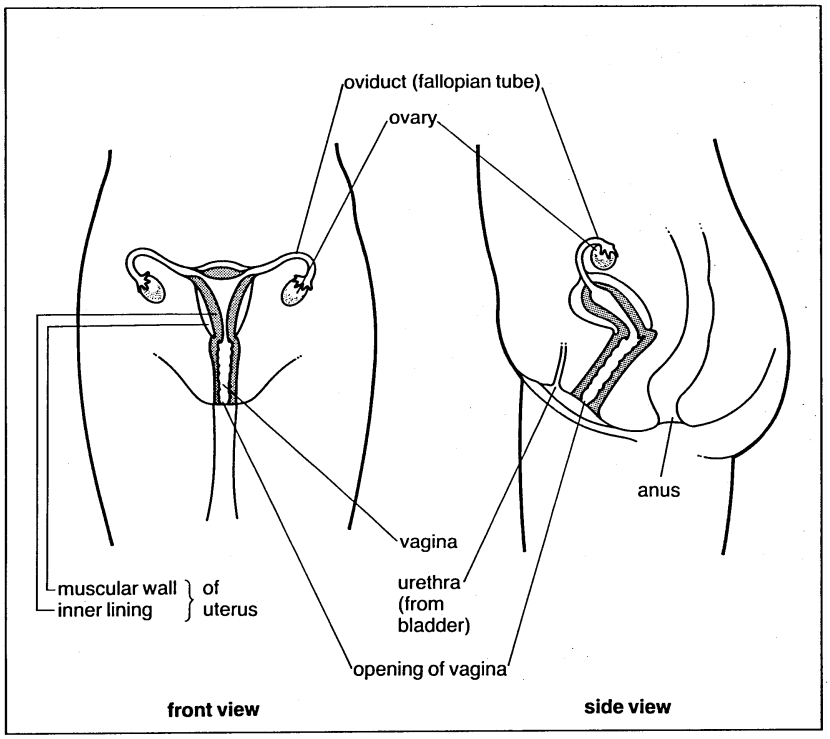

Figure 2 The main parts of the female reproductive system

The male partner may also be examined — and perhaps advised to buy some baggy underpants! Wearing of tight pants and trousers for long periods raises the temperature of the testes too high for best sperm production. Loose clothing can remove the problem.

Figure 3 shows the main parts of the male reproductive system.

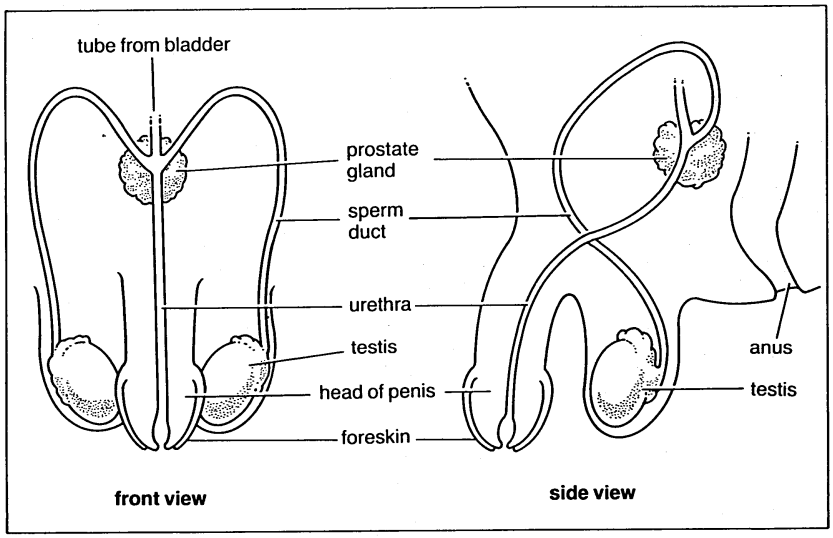

Figure 3 The main parts of the male reproductive system.

The man's sperm may be examined under a microscope. It is usual for about 20 per cent of sperm to be abnormal. If a higher percentage are abnormal, then the man's semen will be tested further. The man may be found to produce fewer sperms than normal. This is called a low **sperm count.** In this case, semen may be collected at intervals. The sperm can be frozen until there are enough healthy sperms to artificially inseminate the woman. (Artificial insemination is when sperm are introduced into the vagina artificially, instead of during intercourse.)

Stage 3 — Checking ovulation

The next stage is to check whether the woman is actually producing eggs — **ovulating.**

The woman charts her ovulation by taking her temperature first thing each morning. The body temperature normally rises during ovulation. She takes these records with her when she goes to see a hospital consultant.

If ovulation is not occurring, this is the stage when 'fertility drugs' may be used. These increase the chances of ova ripening and being released. If ovulation appears to be occurring normally, then the woman may be asked to attend the hospital shortly after having intercourse. The vagina and the opening of the uterus are then checked to see if healthy sperm are present.

Stage 4 — Final examinations

If the sperm are normal, the levels of hormones in the blood of the woman will be measured. This gives a second check on whether she is ovulating. At this stage, if all else seems normal, the oviducts (egg tubes) are checked to see if they are blocked. The most common cause of blocked tubes is infections in the uterus and the tubes. Once the tubes are blocked they cannot usually be unblocked. The only solution here is ***in vitro* fertilization** (*in vitro* means 'in glass'). A better known name for *in vitro* fertilization is 'test-tube babies'.

What is a test-tube baby?

It would be better described as a 'petri dish baby'. The ova and sperm meet in a petri dish, not a test tube.

The stages in the process are shown in Figure 4 on the next page. The woman is given a fertility drug to make sure that as many ova as possible ripen in her ovaries. The ova are then removed by an operation. They are placed in a special solution in a petri dish. Sperm from the man are added and fertilization of several of the ova takes place. The fertilized ova are then allowed to develop for several days, forming small balls of cells. These tiny embryos are replaced in the mother's uterus. If the operation succeeds, one or more of them will develop into a normal baby. The extra embryos may be frozen and stored, used for experiments, or destroyed.

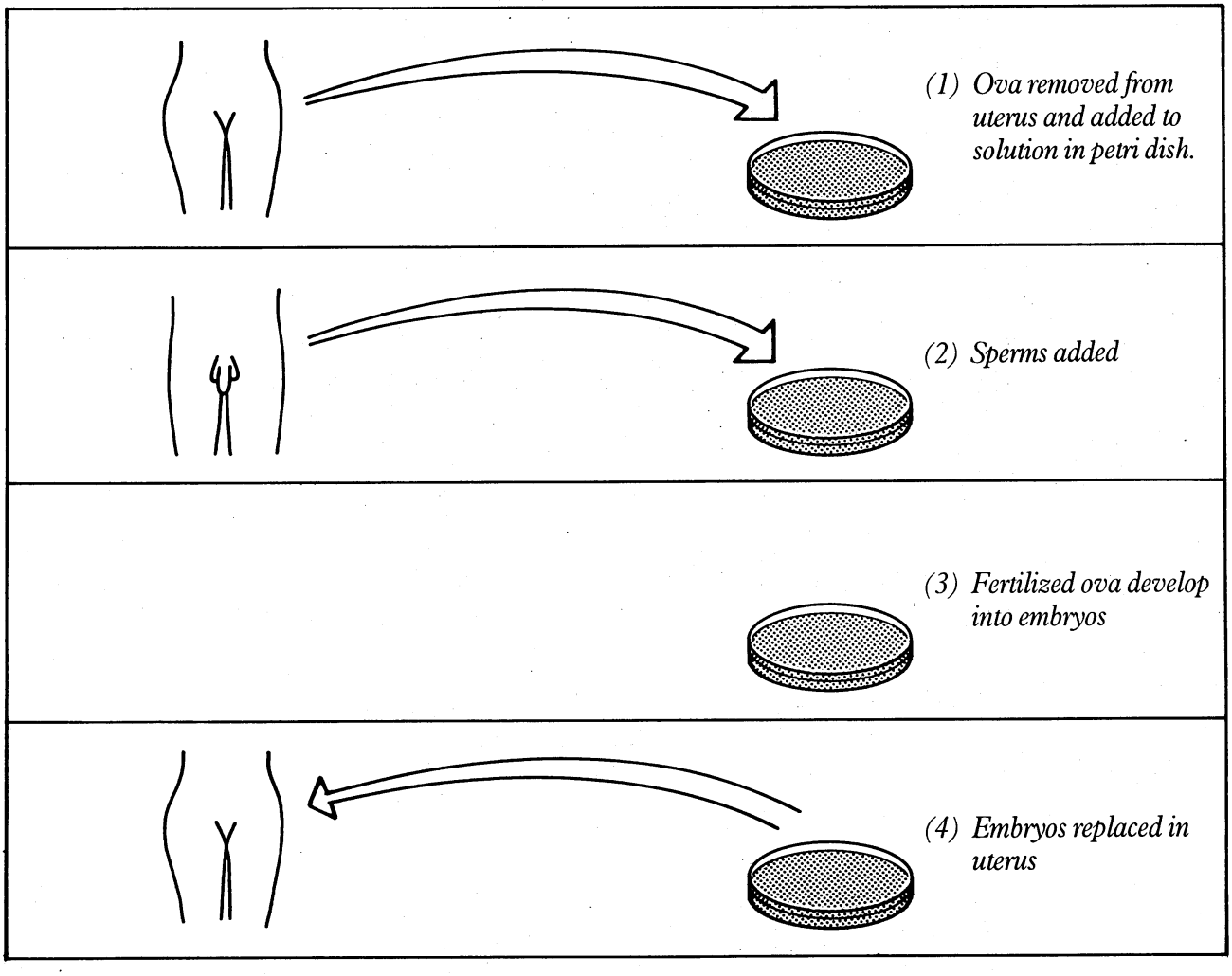

Figure 4 In vitro *fertilization*

The technology that makes test-tube babies possible can bring hope to many childless couples. But it also raises difficult questions for doctors, scientists and society. The government set up the Warnock Committee to look at these questions, and to suggest whether new laws should be made. The questions asked could affect us all. What do *you* think about these difficult points?

The following questions are best discussed in small groups.

The following questions are best discussed in small groups.

Points for discussion

- Embryos can be very useful for medical research on things like transplant surgery and cancer treatment. During *in vitro* fertilization more embryos are produced than are needed. Should these 'spare' embryos be used for medical experiments? If you feel it is acceptable, should there be an age limit after which experiments must cease?
- What about **surrogate motherhoood?** This is where one woman carries a fertilized egg for another woman who is infertile. Should this be allowed?
- Embryos can now be successfully frozen. This means parents need only donate ova and sperm once, but can space their family over several years.
  However, suppose the parents are killed or die. What should happen to the embryos? They could be implanted into a surrogate mother. They could be used for experiments, or they could be destroyed. A difficult decision — what do *you* think?
- When an egg and a sperm meet outside the body, doctors have the chance to examine the chromosomes of the cells. This means that in the future genetic changes might be made before the embryo is implanted into the mother. Genes in the embryo's cells could be removed or replaced. What advantages and problems might this bring?
- To produce a test-tube baby uses up a lot of medical time and resources. Many other areas of the Health Service desperately need money and resources. Do you think money used for test-tube babies is well spent?
- These methods can also be used in animals. What advantages can you see in freezing sperm and using artificial insemination and 'test-tube babies' in the animal world?