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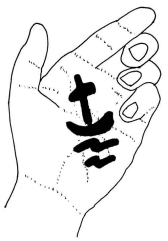

Issues in Human Embryology: Exploring Christian Understandings

A Study Resource Guide for Leaders of Church Groups

CHURCHES TOGETHER *in* CUMBRIA

Introduction

The Social Responsibility Forum of Churches Together in Cumbria is issuing this study resource guide to help church groups in Cumbria to wrestle together with the issues around human embryology, which many Christians will have heard a little about on the news during the passage through parliament of the Human Fertilisation and Embryology Act 2008, but which few of us really understand.

There are many and diverse views on these issues among Christians, as much within as between the different Christian denominations. It is very important that we listen to each other's viewpoints in love and grace, with respect for our fellow Christians, even when we disagree with the views that they are putting forward.

There is no better way to do this than by examining the issues in depth together with those we know and trust in our local church communities. It is the Social Responsibility Forum's hope that these issues will be explored both in local Churches Together and other ecumenical groups and in single denomination house, fellowship, reading and church study groups.

This Guide:

- Outlines some of the main issues.
- Lists excellent national resources produced by the various denominations and details how local groups can obtain these.
- Highlights a couple of novels that some groups may like to read and discuss as a way in to the exploration of some of these issues.
- Explains the meaning of the terms used in talking about human embryology.

This Guide does not provide questions or sessions for study because the Social Responsibility Forum hopes that local groups will use the very high quality resources produced by the denominations at a national level. We urge groups to use not just the materials produced by their own denominations, but also to obtain and study together at least one other set of materials produced by another denomination in order to understand better something of the wide variety of Christian viewpoints on these issues. In ecumenical study groups it is recommended that as many of the different denominational materials as possible are obtained and used to generate discussion.

Due to the complexity and unfamiliarity of these issues, considerable advance reading and preparation may be required to be undertaken by group leaders to enable them to lead their groups through these materials, but it is hoped that the explanation of terms provided in this Guide will make the national study materials much more readily understandable to both leaders and their groups.

Key Issues

Status of the human embryo

When an embryo reaches more than about 120 cells (4-6 days after conception) it forms a blastocyst, which comprises two types of cell separated by fluid: an outer layer, which later becomes the placenta and umbilical cord, and an inner cell mass, which will form the foetus. In a woman's body, the embryo travels to the womb during the first 14 days of its life and may implant itself there. About 70% of all fertilised eggs never reach the womb to implant and so do not develop into a foetus and come to be born. Any split of the embryo into identical twins takes place before 14 days. At around 14 days the primitive streak develops and the embryo starts to develop the characteristics of an individual.

Christians take different views on the status of an embryo at different stages of development. Is it fully human from the moment of fertilisation, the point at which it has a unique genome? Or does this fully human status come later, when the primitive streak is developed? These are important questions for Christians in deciding whether they can support IVF treatment or the use of embryos in medical research.

Using embryos in medical research

Embryos used for research, and sperm and eggs used to create embryos for this purpose, are normally donated by couples who are undergoing IVF treatment. Often spare embryos themselves are donated for research, but in other cases embryos are created specifically for the purpose of research using donated eggs and sperm.

Some Christians are entirely opposed to IVF for various reasons, including opposition to any non-sexual act of embryo production, or that it may lead to the destruction of 'spare' human embryos. Other Christians support IVF and some of these may also accept the use of spare embryos, created for the purpose of IVF treatment, for medical research. They may however draw the line at the creation of embryos purely for the purpose of research. Other Christians will accept this technique too.

For more than a decade research teams around the world, including in the UK, have been using human embryonic stem cells in research to try to further their understanding of a variety of diseases. Embryos are only permitted to be used for research up to 14 days of age or the appearance of the primitive streak, whichever is sooner. After this they are destroyed.

The stem cells that are removed from these embryos are retained for continuing use in research. They can continue growing on their own in what are called stem cell lines and they can be grown into any type of human cell. Scientists hope that eventually they can be used to create healthy cells to replace diseased ones in humans in order to treat conditions such as Parkinson's disease, Alzheimer's disease, and diabetes. Embryo stem cells cannot be transplanted directly into a patient because of a risk of cancer, but need to be differentiated first into the desired specific cell type.

Therapeutic cloning

One way of studying a particular disease, for example motor neurone disease, with the long term goal of creating effective therapies to combat that disease, is to create stem cells which contain the same genetic material as a person with the disease.

To do this researchers take a cell, e.g. a skin cell, from an adult with the disease, extract the cell nucleus, and replace the nucleus of a donor egg with this adult cell nucleus. The cell thereby created contains over 99% of the genetic information (DNA) of the adult and less than 1% of the donor egg. The cell is then activated so that it starts to divide and become an embryo. This process is called Cell Nuclear Replacement (CNR) or somatic cell nuclear transfer, and is more commonly known as cloning.

The resulting embryo, which is a clone of the adult with the disease, is grown in the laboratory for a few days before the stem cells from the embryo are isolated and encouraged to develop into particular cell types, which are then used in the medical research. Once the stem cells have been isolated the cloned embryo is destroyed.

Some scientists hope to be able to use stem cells created through cloning to treat diseases because if the replacement stem cells are genetically identical to the patient needing the cell transplant then there is no rejection of the cells.

Some Christians believe that all cloning is wrong while others consider that the good which may result from carefully controlled therapeutic cloning outweighs the dangers.

Hybrids

Researchers need eggs to carry out Cell Nuclear Replacement, but human eggs are in short supply. Some scientists have proposed using eggs from another animal, e.g. cow or rabbit. The resultant cytoplasmic hybrid embryo would contain less than 1% animal DNA, because the nucleus would have been replaced by a human nucleus. However, the other elements of the embryo would be animal. A true hybrid, as opposed to a cytoplasmic hybrid, would contain equal amounts of two different species' DNA.

Many Christians oppose any mixing of human and animal cell material. Others support the use of carefully regulated cytoplasmic hybrids for medical research, but oppose the production of true hybrids in any circumstance.

Using other stem cells in medical research

Scientists are also researching the medical potential of stem cells from other sources than embryos, including umbilical cord blood and adult bone marrow. Stem cells in umbilical cord blood are not pluripotent, but adult cells may be able to be dedifferentiated back into stem cells and those stem cells redifferentiated out again into the particular kinds of cell needed for research and treatment. Adult stem cells are rare in the body and may have limited potential to be replicated in the laboratory.

Some Christians believe that only adult stem cell research is ethical and argue that it is also effective, citing a number of therapies in which adult stem cells are being used.

Pre-implantation genetic diagnosis

Through IVF, the culturing of embryos in the laboratory for some days gives a medical team the opportunity to take a single cell from an embryo and analyse a number of its chromosomes. This analysis can identify abnormalities of specific chromosomes which are associated with specific diseases and also the presence or absence of a specific disease that results from a single gene defect. This technique is called pre-implantation genetic diagnosis (PGD). It is used particularly in a family which already includes a child with a genetic abnormality and in older women where the chances of an abnormality are higher. Embryos selected for implantation in the mother's womb are those that do not display the genetic abnormality under consideration. PGD screening is now fairly common in Britain for some conditions, e.g. cystic fibrosis and Huntington's disease.

In early 2009 it was reported in the news that for the first time in Britain a girl had been born from an embryo screened using PGD to ensure the absence of a gene (BRCA1) that gives a 50-85% chance of developing breast cancer, because of the extremely high incidence of breast cancer in her father's family. Screening was conducted on 11 embryos developed by IVF, 6 of which were found to carry the BRCA1 gene. 2 embryos which were free of the gene were implanted in the mother's womb, resulting in a single pregnancy. It is estimated that 5-10% of breast cancers have a genetic cause.

For many Christians, PGD raises serious issues about how we value a person and what we mean when we talk about being created 'in the image of God'. Some Christians support it to avoid the birth of children who can be predicted to suffer. Others feel it devalues people already alive who have those genetic conditions, and encourages discrimination on the grounds of 'disability', comparing it with PGD for social gender selection, which is not permitted in law.

Saviour siblings

Another use of PGD, in contrast to 'selecting out' genetic abnormalities, is to select an embryo for implantation that is genetically compatible with an existing sibling suffering from a particular genetic disease. The stem cells from the blood in the umbilical cord of this 'saviour sibling' are then used after the birth to provide treatment for the older child.

There are a number of ethical issues around this practice, again with a variety of responses among Christians to the questions raised. For example, is the existence of the younger child intended primarily to support the well-being of the older one and does this prevent that younger child being given proper value in their own right? The stem cells are drawn at a point at which the donor is unable to give consent, having only just been born. The selection of an embryo for similarity in tissue type with a sibling may place them in a position in later life where they feel themselves constrained to give tissue or organs for further treatment of their sibling. This has led some to call for a protocol for limiting future demands on the donor child.

National Denominational Resources

Anglican

Embryo Research: Some Christian Perspectives: A report from the Mission and Public Affairs Council, 2003.
Download from:
http://www.cofe.anglican.org/info/socialpublic/science/hfea/embryoresearch.pdf
Or telephone the Church of England National Offices to order: 020 7898 1000

Baptist / Methodist / United Reformed Church

Created in God's Image: An Ecumenical Report on Contemporary Challenges and Principles Relating to Early Human Life: Joint Public Issues Team of the Baptist Union of Great Britain, the Methodist Church and the United Reformed Church, 2008.
Created in God's Image: A Study Guide: Joint Public Issues Team, September 2009.
Will be available for download from:
http://www.methodist.org.uk/index.cfm?fuseaction=opentoyou.content&cmid=1681
For more information contact Wendy Cooper at the Joint Public Issues Team:
020 7916 8632; Wendy.Cooper@urc.org.uk

Church of Scotland

Embryo Research, Human Stem Cells and Cloned Embryos: A report from the Church and Society Council, 2006.
Download from:
http://www.srtp.org.uk/srtpage3.shtml#StemReports
Or telephone the Society, Religion and Technology Project to order: 0131 240 2250

Roman Catholic

Parish Resource Pack to raise awareness about the Human Fertilization and Embryology Bill: Prepared by St Mary's University College on behalf of the Bishops' Conference of England and Wales, 2007.
To order, telephone the Catholic Bishops' Conference of England and Wales offices:
020 7630 8220, or the Lancaster Diocesan Faith and Justice Commission: 01524 383081

Novels

Rather than looking first or only at the denominational material, some groups may prefer to access particular issues in a different way, perhaps through reading a novel and exploring together their reactions to the issues raised.

Two recent novels have come to the Social Responsibility Forum's attention, which touch on issues highlighted in this study resource guide:

My Sister's Keeper: Jodi Picoult, Hodder & Stoughton, 2004

This novel is about a saviour sibling who is conceived to donate cord blood, but continues to be required to be her sister's medical donor throughout her childhood. Focused, readable and plausible, the novel highlights many ethical questions around this issue. The book also contains an interview with the author around some of the issues and a set of discussion questions.

***Never Let Me Go*: Kazuo Ishiguro, Faber & Faber, 2005**

This novel imagines a contemporary England where reproductive human cloning has for many years been carried out to provide involuntary organ donors, sacrificed to save the lives of the rest of the population. Although not apparently intended to be a work of realism, the novel nevertheless raises many important ethical questions of relevance to the issues in this study resource guide, e.g.

1. What is 'normal'?
2. What is the essence of being human?
3. To what extent should the 'end' of potentially developing successful medical treatment for terminal and severe chronic disease be used to justify the means?
4. Can science ever justifiably be used to allow society to control the future of a 'potential' human being (an embryo)?
5. Is permitting some kinds of cloning the start of a 'slippery slope'?

Glossary

Please note that the definitions which follow are grouped thematically.

Cells: The building blocks of human beings and other animals. Our bodies have various types of cell, e.g. brain cells, muscle cells, eggs and sperm. Every cell has the same amount of genetic information (DNA) except for eggs and sperm, which have half the amount of other cells.
Nucleus: The control centre of a cell, which contains more than 99% of the cell's DNA.
Stem cells: Particular types of cells in humans and animals which are able to renew themselves. There are 3 sorts of stem cells: adult stem cells, cord blood stem cells, embryonic stem cells.

Genome: The genetic characteristics of an organism.
Human embryo: Formed when a sperm penetrates an egg, fertilising it and merging with its genetic material to form a unique genome.
Primitive streak: The point at which an embryo becomes an individual, with the basis of a nervous system and organs, a separation of their supporting tissue (placenta and umbilical cord) and no further possibility of twinning. The development of the primitive streak occurs about 14 days after the embryo is formed.

IVF: *In vitro* fertilisation, i.e. fertilisation that occurs outside a woman's body, in the laboratory. Treatment used to help couples have a child who are having difficulty doing so naturally. IVF treatment comprises: ovarian stimulation to produce superovulation so there is a supply of several eggs, egg retrieval, *in vitro* fertilisation, growth of the embryo(s) in the laboratory, and transfer of one or more embryos back to the mother's womb.

Embryonic stem cells: Human embryonic stem cells come from a fertilised human embryo that researchers have allowed to grow in the laboratory for 5-6 days. These cells can develop into any of the body's 200 different cell types. Once removed from the embryo the stem cells are kept in a mix of nutrients which keep the cells in their unspecialised state.
Pluripotency/totipotency: The ability to grow into multiple types of human cells. Embryonic stem cells possess this characteristic.

Cell nuclear replacement (CNR), somatic cell nuclear transfer, or cloning: All these terms refer to the replacement of the cell nucleus of a donor egg by the cell nucleus of an adult cell to produce an embryo with almost identical DNA to the adult. This was the process used to create Dolly the sheep.
Therapeutic cloning: Cloning for tissue development only, for medical research purposes.
Reproductive cloning: Cloning to create another animal or human being with an identical genome to an existing individual (as happens naturally only in identical twins). Human reproductive cloning is forbidden in law.

Cytoplasmic hybrid embryo (cybrid): An animal egg cell with the nucleus replaced by the nucleus from an adult human cell.
True hybrid: A species cross containing equal amounts of two different species' DNA. In nature this only occurs in the case of a mule or hinney (a cross between a horse and a donkey) because they are genetically similar / closely related.

Pre-implantation genetic diagnosis (PGD): Removing a cell from an early embryo and testing it for genetic disorders.
Monogenic defect: A defect in a single gene that results in a particular disease.
Chromosome: Thread like structure comprised of a number of genes.
Gross chromosomal abnormality: Abnormality of a specific chromosome associated with a specific disease.
Polygenic characteristic: A body characteristic (such as physical appearance, memory or intelligence) or a disease that is influenced by a number of genes /chromosomes.

Saviour sibling: A baby wanted/conceived not only for itself, but also to offer stem cells from its umbilical cord blood to a sibling suffering from a genetic disease, e.g. sickle cell disease.

Acknowledgement

The Social Responsibility Forum drew heavily on the national denominational resources listed on p.6 in preparing this Guide and also on material produced by Dr Murdo Macdonald, Policy Officer for the Church of Scotland Society, Religion & Technology Project. We acknowledge these sources with grateful thanks.

For more information about resources or for other advice about using this Guide locally contact: Helen Boothroyd, Social Responsibility Development Officer
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