

CHAPTER 3.6: HUMAN STEM CELLS

INTRODUCTION

Stem cells are relatively ‘unspecialised’ cells that have the unique potential to develop into ‘specialised’ cell types in the body (for example, blood cells, muscle cells or nerve cells). They occur at all stages of human development, from embryo to adult, and in many (possibly most) tissues of the body.

As well as being central to normal human growth and development, stem cells are a potential source of new cells for the regeneration of diseased or damaged tissue.

Stem cells have considerable capacity to be of clinical benefit, but they may also carry significant risks in clinical use, especially if their growth and differentiation is unable to be controlled.

Stem cells and their sources can be described as follows:

- *embryonic stem cells*, which have been derived from human embryos in the first 3-5 days of development, usually after a blastocyst has formed;
- *somatic stem cells* (also known as non-embryonic stem cells or adult stem cells), which are derived from the human body after the embryonic stage. They include foetal and umbilical cord stem cells, as well as cells such as mesenchymal and haematopoietic stem cells that have been used in clinical practice for a number of years; and
- *stem cells derived from primordial germ cells*.

Most parts of the human body contain somatic stem cells that lie dormant in most circumstances. A new area of research involves attempts to stimulate the activity of these stem cells for therapeutic purposes. This activity carries possibilities for benefit and harm similar to those of transplanted stem cells and must meet similar ethical requirements for intervention and safety.

Legislation

The *Research Involving Human Embryos Act 2002* (the RIHE Act) and corresponding State and Territory legislation establishes a regulatory framework for the use of excess assisted reproductive technology (ART) embryos. This legislation and the licensing authority established by it does not regulate the use in research of stem cells or stem cell lines after they have been derived from an excess ART embryo.

The RIHE Act refers to *Ethical guidelines on the use of assisted reproductive technology in clinical practice and research* (NHMRC 2004), known as the ‘ART guidelines’. At paragraphs 17.10 – 17.18, these guidelines provide guidance for the design, ethical review and conduct of research involving excess ART embryos, but they do not regulate the use of stem cells obtained from human embryos.

Stem cell research

Research into stem cells is in two major classes:

- research into new and developing therapies. Some of these are based on long-standing cellular therapies, the ethics of which have their origin in well established ethical practice in transplant and blood transfusion. Such research also includes clinical trials and innovative therapy involving stem cells or their products;
- research on the cells themselves, leading to knowledge about cellular disease processes. This research includes studies on the pluripotentiality or multipotentiality of stem cells, studies related to drug metabolism and therapeutics, and attempts to improve understanding of specific diseases.

Scope of this chapter

The guidelines in this chapter relate to research using derived human stem cells or stem cell lines, whether embryonic, somatic or derived from primordial germ cells.

Applicability of other chapters and documents

For the purpose of these guidelines, human stem cells are regarded as human tissue, so that *Chapter 3.4: Human tissue samples* also applies to research involving their use.

Since these cells carry the human genome and may either carry the genome of a born individual or be genetically related to born individuals, *Chapter 3.5: Human genetics* also applies.

Research to derive and study stem cells from the human umbilical cord, placental tissue, human foetal tissue or amniotic fluid is also subject to the guidelines set out in *Chapter 4.1: Women who are pregnant and the human foetus*.

The guidelines in this chapter deal only with the use of stem cells, not the ethical issues pertaining to the method by which they were derived and collected. They also deal only with the use of stem cells of entirely human origin, not those of transspecies origin.

Where clinical research is proposed using stem cells, reference may be needed to the requirements of the Therapeutic Goods Administration (TGA), the *Australian Code of Good Manufacturing Practice for Medicinal Products*, and the *Australian Code of Good Manufacturing Practice for Human Blood and Tissues*.

Cells, however derived, with the capacity of gametes, are subject to the NHMRC *Ethical Guidelines on the use of Assisted Reproductive Technology in Clinical Practice and Research* (2004).

Research to which this chapter applies must be reviewed and approved by a Human Ethics Research Committee (HREC) rather than by one of the other processes of ethical review described in paragraphs 5.1.7 and 5.1.8 (page 78), except where that research

uses collections of non-identifiable data and involves negligible risk, and may therefore be exempted from ethical review.

Values, principles and themes that must inform the design, ethical review and conduct of all human research are set out in Sections 1 and 2 of this National Statement. The guidelines and headings below show how those values, principles and themes apply specifically in research that is the subject of this chapter.

GUIDELINES

Research merit and integrity

- 3.6.1 Researchers and HRECs should seek advice from the NHMRC on clinical research that proposes novel uses of stem cells.
- 3.6.2 Clinical trials involving the grafting, transplant or activation of human stem cells in humans should be conducted only where there is substantial evidence, from pre-clinical models, of safety and efficacy.

Justice

- 3.6.3 Identifiers should not be removed from stem cells without the consent of the donor if the removal would make it difficult to communicate information that could benefit the donor or his or her blood relatives.
- 3.6.4 Potential donors of material from which stem cells are derived should be informed that the individual donor may remain identifiable even if his or her genome is only partly represented in those stem cells. This is particularly so if analysis of the stem cells is combined with other sources of information such as genealogical, phenotypic (including medical record) or genetic data.

Beneficence

3.6.5 Those conducting research involving stem cells derived from a human embryo or foetus should have no involvement in the clinical care of the woman from whom an ovum, embryo or foetus was obtained. Such research should be conducted in a location that maintains a separation of the woman's clinical care from research (see paragraph 4.1.11, page 53, and the ART guidelines, clause 15.5).

Respect

3.6.6 In addition to the information described in paragraph 2.2.2 (page 19), those who are considering donating embryos or tissue for the derivation of stem cells for research should also be given:

- (a) an explanation of the research for which the stem cells are to be used and, where extended or unspecified consent is sought, sufficient information to meet the requirements of paragraphs 2.2.1 (page 19) and 2.2.16 (page 21);
- (b) an explanation of the implication of removing identifiers (see paragraphs 3.6.3 and 3.6.4) from stem cells, including loss of a say in the use of the stem cells and, potentially, loss of their use for treatment for the participant or his or her blood relatives;
- (c) an assurance that they are free to decline to participate in research and entitled to withdraw from research at any time before identifiers are removed and a cell line is created;
- (d) an explanation that the research could result in the production of a stem cell line that could be maintained for many years, distributed to other parts of the world, and used for various research purposes; and

- (e) an explanation that the research participants will not benefit financially from any future commercialisation of cell lines, and that the donor will not have any authority over any cell lines created once their identifiers have been removed.

Conscientious objection

3.6.7 Those who conscientiously object to being involved in conducting research with embryos, fetuses or embryonic or foetal tissue should not be obliged to participate, nor should they be put at a disadvantage because of their objection.

Imported stem cell lines

3.6.8 Where stem cell lines have been created in another country, their use in research in Australia is also subject to paragraph 3.4.4 (page 39).