

# Embryonic Stem Cell Research: Ought We Do What We Can Do?

Dr Roland Chia

## Introduction

'Embryonic Stem Cell Research: Ought we do what we can do?' This is the question that I hope to answer in this talk. The clinical potentials of embryonic stem cell research have presented some with a kind of moral dilemma. This dilemma is expressed succinctly by President George Bush in a speech published by the New York Times on August 12 this year, two days after he announced his decision regarding federal funding of stem cell research. Decision against embryonic stem cell research is a difficult one, according to the President, because it 'pits good against good' – namely that 'the promise of miracle cures is set against the protection of developing human life'. Many scientists, ethicists and philosophers, and members of the public share President Bush's dilemma. But this dilemma will evaporate when we come to understand that the advancement of science can never be the justification for harming and destroying human life, not least that of the vulnerable and the non-consenting.

The controversies surrounding embryonic stem cell research centres on the status of the embryo. The question may be simply put. All scientists would recognise that the embryo is a human organism; it is described as human life. But is the embryo a human being? If it is a human being, is it also a person? Embryonic stem cell research would indeed be tantamount to murder if it can be established that the embryo is a human person. But scientists generally tend to think of it merely as a human organism, albeit one with the potential of developing into a human being. Another issue associated with embryonic stem cell research is the question of the 'greater good'. Most scientists would agree that stem cell research hold such great promise for biomedicine. It may allow scientists to find a cure for such dreadful diseases like Alzheimer's, cancer, and even AIDS. Should one prevent such potential good from being realised simply because of one's

hesitation to 'sacrifice' embryos, which, in the case of those produced for In Vitro Fertilisation, would be destroyed anyway?

I shall attempt to examine these two issues pertaining to embryonic stem-cell research, and present a Christian response. But a caveat before I do so. By Christian response I am referring to the way in which one can, on the basis of the entire witness of Scripture and tradition, present a theological position regarding the status of the embryo, and the corresponding attitude that one must have towards it. I must say that mine is not the only position that has been forwarded by the Christian community. I would therefore invite you to examine closely my arguments and judge their tenability for yourselves. Before we examine the theological arguments, let us take a brief look at the current stage of stem cell research.

### Current Stage of Stem Cell Research

Knowledge about stem cell science and its potential applications has a history of some thirty years. In the 1960s certain mouse cells which had the capacity to develop multiple tissue types were discovered. This led to the discovery, in 1971, of bona fide cells from mice. But it was only in November 1998 that scientists were able to do what had eluded them for two decades, namely the isolation and culturing of human embryonic stem cells. Scientists believe that these cells will allow them to find a way of treating a large variety of diseases for which there is no treatment presently. The potentials for embryonic stem cell research will be discussed in another section. The purpose of this present section is to report, albeit very briefly, the current status of stem-cell research.

'Stem cells' is a term that describes precursor cells which has the potential to differentiate to multiple tissue types. Embryonic stem cells are the cells from which 210 different kinds of tissue in the human body originate. The most important distinctions among the stem cells have to do with how 'plastic' they are, i.e., how 'many different paths they can follow and to what portion of a functioning organism they can contribute'. *Totipotent* cells are cells that can give rise to a fully functional organism as well as to every cell type of the body. Put differently, each totipotent cell can replicate and differentiate and

become one or more than one human being. Science has yet to unravel this phenomenon. All the cells of an early embryo are totipotent until around the 16 cell stage. Before day 14, these inner cells can split into half, and each half can develop into an embryo, resulting in identical twins. *Pluripotent* cells are more differentiated cells, and therefore are less plastic and more determined, with the ability of giving rise to only a limited number of tissues. These cells can develop into any of the three major tissue types: endoderm (interior gut lining), mesoderm (muscle, bone and blood) and ectoderm (the nervous system and epidermal tissues). Pluripotent cells can also develop into end organs, but because they are more specialised, they cannot develop into a human being. The final category comprises tissue specific cells, like the hematopoietic stem cells, which are committed to developing all types of blood cells. These cells are called *multipotent* and have the capacity to differentiate into only a few cell lines different from their lineage.

Stem cells may be obtained from various sources. *Human embryonic stem cells* are taken from the inner cell mass of a blastocyst, which is a very early embryo. These cells are valuable scientifically because of their ability to replicate themselves indefinitely without undergoing senescence (ageing and death). Put differently, they are 'immortal', that is, they have the capacity for unlimited self-maintenance. ES cells could also differentiate into many cell types in tissues including blood cells, cardiac and skeletal muscle. The clinical potential of this will be discussed in a later section. The isolation and growth of these cells would allow scientists to obtain millions of these cells in a single tissue culture flask. *Human embryonic germ cells* are collected from fetus tissue at a somewhat later stage of development. In November 1988, scientists successfully isolated, cultured and characterised these cells from the gonadal ridge of human tissue obtained from abortuses. These cells were capable of producing the three germ layers that make all the organs in the body. *Human adult stem cells* are obtained from mature tissue. These give rise to a number of cell types and therefore are called *pluripotent* cells. The limitations and value of these adult stem cells are clearly explained in the AAS /ICS Report:

Adult-derived stem cell therapies will complement, but cannot replace, therapies that may be eventually obtained from ES cells. They do have some advantages.

For example, adult stem cells offer the opportunity to utilise small samples of adult tissues to obtain an initial culture of a patient's own cells for expansion and subsequent implantation ... With proper manufacturing quality controls and testing, allogenic adult stem cells (cells from a donor) may be practical as well. Already in clinical use are autologous and allogenic transplants of hematopoietic stem cells that are isolated from mobilised peripheral blood or bone marrow by positive selection with antibodies in commercial devices (p. 4).

But the most important point here is that adult stem cell research generates less ethical concerns because these procedures will not destroy the adults from whom stem cells are taken.

At the current stage of technology, ES cells cannot be obtained without destroying the embryo. Two independent teams of scientists, one at the University of Wisconsin-Madison and the other at Johns Hopkins University in Baltimore, Maryland, succeeded in isolating and culturing ES cells from two sources. The Wisconsin team, headed by Dr. James Thomson, uses a human egg that has been fertilised *in vitro*. This fertilised egg is itself a totipotent cell. Thomson nurtures this to the blastocyst stage – that is, to about four to six days – and then exposes the inner cell mass by removing the trophoctoderm (outer shell). He then separates the cells and puts them on a feeder tray and cultures them. The cells are now *pluripotent*, and are capable of generating into any bodily tissue. Dr John Gearhart, who heads the Johns Hopkins team begins with an abortus at about the five to eight week stage. He removes the primordial germ cells, which are still at full complement of 46 chromosomes, and places them on feeder tray, where they are become cultured pluripotent hEG cells. The difference between hES cells and hEG cells is unclear at this stage. Both are pluripotent and have similar functions. It is also uncertain at this stage (although not improbable) that ES cells can be obtained in any other way. There is a possibility of 'tricking' what is called the 'progenitor cells' (or committed cells) into becoming totipotent cells. But scientists have not yet found a way of doing this.

## **A Human Life Begins At Conception**

Not all scientists are agreed on the point where human life begins. Several theories, all defensible scientifically, have been forwarded. The first hypothesis, the 'genetic view' maintains that human life begins when the human egg and sperm nuclei fuse at fertilisation. The second hypothesis argues that human life begins at 14 days after fertilisation when the embryo individuates. It is also at this time that 'twinning' sometimes occurs. This is the view adopted by the Human Fertilisation and Embryology Authority in Britain. The third view maintains that human life begins when the human-specific electroencephalogram (EEG) is acquired at around six weeks. The fourth view is that human life begins when it is metabolically independent from the mother, that is, at the traditional birthday.

I believe that it is the first view that most closely approximates the Biblical concept of human life. Let us, then, begin by looking at what the Bible does and does not say about human beginnings. Does the scripture address the question whether human life begins at conception? Or is this question a modern one that the writers of the Bible were not concerned about? Perhaps the most powerful passage in the Old Testament about the sacredness of fetal life is found in Ps 139:13-16. Listen to the eloquence and power of its poetic language. I shall read from the New Jerusalem Bible:

It was you who created my inmost self,  
and put me together in my mother's womb;  
for all these mysteries I thank you:  
for the wonder of myself, for the wonder of your works.

You know me through and through,  
from having watched my bones take shape  
when I was being formed in secret,  
knitted together in the limbo of the womb.

You had scrutinized my every action,  
all were recorded in your book  
my days listed and determined  
even before the first of them occurred.

It must be pointed out at the outset that this passage was not written in the language of modern science. It was written in poetic language. It must also be pointed out that the concern of the psalmist here is not to deal with the question whether human life begins at conception or at a later stage. But there can be gleaned from this passage several important theological truths about the value of fetal life. The first is the fact that the emergence of human life can never be just a biological process. In eloquent poetic language, this passage tells us the simple yet fundamental truth that God is profoundly and intimately involved in every human beginning.

Scripture also teaches that the emergence of human life is part of God's plan. This was God's Word to Jeremiah: 'Before I formed you in the womb I knew you; before you came to birth I consecrated you'. Out of the severest of anguish Job stops to contemplate the work of God, and acknowledges the fact that it was God who gave him life and brought him into being: 'Your own hands shaped me, modelled me; and would you now have second thoughts and destroy me? You modelled me, remember, as clay is modelled, and would you reduce me to dust? Did you not pour me out like milk, and curdle me then like cheese; clothed me with skin and flesh, and weave me of bone and sinews. Then you endowed me with life...' Although these passages do not, as I said, deal directly with the question whether human life begins at conception, they suggest that the life of every individual, from its very beginning, is part of God's plan and the result of divine intervention. But is it not possible to conclude from these passages that from its earliest beginning, the embryo is already a human being? Does not the idea that the human embryo is a special creation of God suggests that at its earliest moments of life it is already a being created in the image of God? If God already knows the identity of the yet to be conceived embryo, as Jeremiah 1:5 suggests, is it not legitimate to conclude that from its earliest moments, that is, from conception, this organism has an identity and a destiny. The embryo is already a human being, whose coming into being was the result not just of biological processes but more fundamentally and importantly that of divine agency.

The theological position that postulates that human life begins at conception is further strengthened when one considers the doctrine of incarnation. The great truth in the doctrine of the incarnation is that

God became man in Jesus Christ, beginning with the virginal conception. The best of Christian tradition teaches that the incarnation did not begin when the baby Jesus was born, but at his miraculous conception. The significance of this is of course that Jesus did not only take on human flesh at birth, but at conception. And it is because this is so, Jesus' identification with us, and thus his redemptive activity for us is complete, covering every stage of human development, pervading every aspect of what it means to be human. In the incarnation, the Son of God has identified and redeemed all of human life from the darkness of the womb to the darkness of the tomb. In Christ, and before God, we are all 'fellow fetuses', to use Paul Ramsey's memorable if provocative phrase. Before God we have no claims or achievements to boast about, no status to declare. Before him we can only give thanks for the fact that our whole life is taken up by the death and resurrection of Jesus Christ, from the moment of conception to our last breath.

Interestingly, the Greek for 'baby', *brepheos* is used to refer to both the embryo and the new-born baby. This points to the continuity of identity and status of the embryo and the new-born infant. Psalm 139 emphasises that continuity by explicitly denying any discrimination between achievement and potential. This is very important especially since at least some of the debate surrounding embryonic stem cell research is focused on the argument of potentiality. Here in this passage, the unformed fetus, whose bones are still being shaped, receives equal attention, and is bestowed equal value by God. This means that the continuity of life – from its earliest beginnings, to its most matured form – is affirmed by Scripture. This affirmation challenges the potentiality argument that artificially creates a distinction between the zygote as a potential human being and the fetus as a human being. In Scripture, achievement and potential are placed in one unbroken continuum. From the very beginning, the embryo is a human being, created in the image of God. The continuum presented by Scripture prohibits us from thinking that the embryo is but a potential human being. This brings us to the statement made by a third century Church Father, Tertullian: *Homo est et qui est in futurus* ('He who is ever going to be a man is already one').

It is thus not unreasonable to conclude that the only acceptable moment for the origin of human life is one that is prior to any and all

development, namely at conception. It is at conception that the zygote is endowed with its own genetic code, and its human nature, which enables it to develop and mature. It is therefore incorrect to say that the zygote merely possesses human life, and has a potential to become a human being. To do this is to make a distinction between achievement and potential, which Scripture itself does not make. Furthermore, skin tissue, sperm and egg insofar as they come from human beings may all be described as human life. To categorise the embryo as human life, therefore placing it alongside skin tissue, would be to mislead, since only the zygote will develop into a mature human being, while skin tissue will never do so. Because there is no distinction between achievement and potential, we must maintain that the zygote can articulate itself into a matured human being because it is already a human being. To those who argue that the zygote does not look like human being, we must answer by saying that that is exactly what we look like – what you and I look like – at that stage of development. Put differently, a zygote of human parentage cannot articulate itself into a dog or a cat. Just as the zygote of a horse bears the nature of its parents, the zygote of human parentage is an organism with the same nature as its parents.

### The Question of Personhood

But if the zygote is a human being, is it also a person? When we look closely at Ps 139, we notice that this passage treats the fetus as a person. This is clearly evidenced by the use of the personal pronoun. 'You ... created *my* inmost self, and put *me* together ... You know *me* through and through, from having watched *my* bones take shape when I was being formed in secret', etc. Here we have a relational concept of personhood. In the secret place of the womb, the fetus is already a person because God knows it and is related to it. The fetus is a human *I* who is addressed by the divine *Thou*. In connection to this, the personal pronoun also gives us an idea of the nature of human identity. Our identity is based on the divine knowledge. Our identity does not come intrinsically from ourselves, but from God. We are who we are because God has created as such and he knows us, according to who he has created us to be. From this we can conclude that the zygote

bears the image of God, even though it cannot yet reflect it fully. The zygote, as a human being made in the image of God, is a person. It has an identity, and it is in relationship with God.

It must be emphasised that the distinction between a human being and a person, so prevalent in modern scientific discourse about the status of the embryo, is a very recent development in philosophy. This distinction is based on three different theories of the decisive moment of the emergence of personhood. The first is related to developments in neuroscience. On the supposition that brainwaves of a certain kind are correlated with personhood, some have concluded that the conceptus of human parentage is a human being but not a person before brain waves are generated usually at around forty-five days of pregnancy. Proponents of this position also argue that it is possible for human beings to retrogress from persons to non-persons. A victim of brain damage is an example of this retrogression. Proponents of this position also use death as an analogy. They argue that since the discontinuation of brain waves for a period of time is the legal definition of death and thus the end of personhood, so the beginning of brainwaves must be considered to be the beginning of personhood in the fetus. The emergence of the EEG is therefore the decisive moment for the emergence of personhood. This analogy, however, fails for a simple reason. Brain death cannot be compared with the absence of brainwaves in the fetus. The dead brain cannot revive itself. The fetus, however, only lacks first order brain function. The fetus has a temporarily flat EEG, whereas the dead person has a permanently flat EEG. There are therefore significant differences between a dead person who lacks both personality and brain activity, and a fetus who lacks first order capacity for brain capacity but will develop it after a period of gestation.

Another theory argues that the decisive moment of the emergence of personhood is sentience. This theory maintains that before the fetus is able to experience sensations, particularly pain, it does not yet possess personhood. The inadequacies of this definition of personhood are obvious. Based on this argument, a comatose person, a person who has sustained serious head injury, leaving only the brain stem functioning, an unconscious person, are all not persons because they are not sentient. Proponents of this view may of course object that with such persons, sentience is but temporarily suspended, and that they

were once sentient. But this objection must imply that personhood is constituted by something other (or at least something more) than sentience.

The third, and perhaps most compelling argument, is that the decisive moment is when the embryo is implanted onto the womb. Proponents of this view present at least three reasons why they believe that it is the most convincing. We shall look at each in turn. The first is the fact that 20 to 50 percent of the pre-implantation embryos or zygotes spontaneously miscarry before implantation. This means that implantation is the critical moment which signals the emergence of the essence of the embryo. Some proponents of this view also present the moral challenge to those who maintain that the zygote is already a person. If these organisms are persons, then it is our moral responsibility to try to prevent the 20 to 50 percent from perishing. In reply we must stress that just because up to 50 percent of embryos miscarry, it does not mean that personhood only begins at implantation. This is because the nature of the embryo is not dependent on the number of miscarriages, but is intrinsic to it. But even if the embryo is a full human person – as we maintain – we are not under the obligation to rescue them from the natural process of death through spontaneous miscarriage. Not interfering with the natural process of embryo death is different from killing an embryo.

The second reason is that it is at implantation that the zygote 'signals' its presence through the production of hormones. But surely the awareness of the presence of the fetus through the production of hormones cannot be equated with the emergence of personhood. The nature of the fetus is surely independent from another's awareness of its presence – even if this is a chemical awareness through the production of hormones. The third reason is that 'twinning' occurs just after implantation. This is an argument based on the concept of the person as an individual. According to this position, if individuation takes place at implantation, so must the emergence of personhood. But just because twinning happens after implantation does not mean that the embryo before splitting is not a human person. It may well be shown that the embryo may already possess the genetic code for twins. Put differently, it is equally possible for two persons to have existed before implantation. The phenomenon of twinning cannot be used as an ontological argument for the emergence of personhood at

implantation. If personhood emerges after implantation, then theoretically scientists have the ability to control or confer personhood since they can delay or refuse implantation.

Theology cannot make a distinction between a human being and a person. If we are allowed to say that it is possible to be a human being without being a person, then we must also be allowed to ask if the person is a human being. If being human is different from being a person, and if the human being develops into a person at a later stage, we must ask if the human being still exist when personhood is attained? If the human being continues to exist, then are there two beings, a person and a non-person? But if the answer is No, if the human being and the person are one being, that is, a person is a modification of a human being, like adulthood modifies a child, then a contradiction would arise. How can a person and a non-person be both the same being? This contradiction would of course be avoided if it is held that the human being is always a person, and never a non-person. A human being is always simultaneously also a person. Personhood is not an added extra, but is intrinsic to being human. Being human and being a person demands a common subject – the individual member of the human race, who is a personal being.

### **The 'Greater Good' Argument**

I have argued that human life begins at conception, and that there cannot be a distinction between being human and being a person. The embryo or zygote is a person, a human being created in the image of God. This is enough for us to object to embryonic stem cell research that results in the destruction of embryos. But we cannot discuss this issue without looking at another argument forwarded by some in defence of embryonic stem cell research. Scientists are well aware of the potential applications of stem cell research, especially in the eradication of diseases for which there is presently no cure. There can be no doubt that the economic and psychological burdens of chronic illnesses in developing and developed countries are enormous. The advantage of being able to prevent certain illnesses and cure others through genetic testing and therapy is obvious and provides a compelling basis for undertaking research to make this possible.

Already genetic tests have dramatically improved countless lives. These tests enable physicians to confirm diagnosis of certain diseases and to administer proper treatment for the best results. Aggressive monitoring for and removal of colon growths in those who inherited a gene for familial adenomatous polyposis has saved many lives. The same can be said for the identification of people in high risk for conditions that are preventable. Imagine the possibilities if more is known about how our genes work. The same may be said for potential stem cell applications. Because embryonic germ cells have a great differentiation capacity, and because embryonic stem cells have the capacity to differentiate to any tissue, potential for stem cell applications is enormous. Here are some examples.

Many diseases involving the nervous system are due to the loss of nerve cells. Because these mature cells cannot replicate themselves, dead cells are not replaced, and without a source of functioning nerve tissue, therapeutic possibilities do not exist. The pathology of Parkinson's disease is largely known. There is a depletion of pigmented neurones in substantia nigra, hyaline material in nigral cells, atrophic changes in the substantia nigra and depletion of neurones in locus caeruleus. The nerve cells that produce the chemical dopamine die and cannot be replaced. Current treatment involves among other drugs the use of selegiline, an inhibitor of monoamine oxidase type B, which is purposed to reduce the rate of removal of dopamine, and to prolong its action. The current management strategy is to relieve major symptoms. The only hope for individuals suffering from Parkinson's – and indeed from Alzheimer's and multiple sclerosis – come from the creation of new nerve tissue. This can be potentially accomplished by using pluripotent stem cells. Sufferers of Parkinson's who have been treated by the surgical implantation of fetus cells into their brain has shown some improvement, thereby demonstrating the potential effectiveness of this approach. Absolute success is perhaps prevented by the lack of sufficient numbers of dopamine secreting cells, which can be surmounted through the use of differentiated pluripotent stem cells. Similar approaches can be taken to replicate and replace dysfunctional cells in cortical and hippocampal brain regions of patients with Alzheimer's.

Another potential application of pluripotent stem cells is to sufferers of Insulin Dependent Diabetes Mellitus (IDDM) or Type 1

Diabetes. This condition is a clinical syndrome characterised by hyperglycaemia due to absolute or relative deficiency of insulin. Type 1 Diabetes is an autoimmune disease which destroys the insulin producing cells in the pancreas. Current treatment includes human islet transplantation aimed at restoring insulin secretory functions. This method is however inhibited by the limited number of donated pancreas, and the toxicity of immunosuppressive drugs that are required to prevent graft rejection. Pluripotent cells engineered to differentiate into a particular pancreatic cell called beta cell can meet both limitations. They can overcome the shortage of transplant material and be engineered to resist immune attacks and graft rejections. In fact, pluripotent cells can be used to treat all forms of immunodeficiency diseases, including the Acquired Immune Deficiency Syndrome (AIDS). Pluripotent cells could also be used to replace hematopoietic stem cells which produces healthy blood in bone marrow to resist infection by the human immunodeficient virus (HIV). Similar approaches can result in the treatment of other autoimmune diseases including combined immunodeficiency disease (the 'bubble-body' disease), Wiskott-Aldrich Syndrome and systemic lupus erythematosus. Properly differentiated stem cells can be used to correct degenerative conditions in which the bone or cartilage cells are deficient in numbers or in function as well as genetic disorders like osteogenesis imperfecta.

The great potential of embryonic stem cell research must not cause us to detract from the fundamental question of the ethics of such research. If the preimplantation embryo is a human being and a person, then the potential of embryonic stem cell research cannot justify its destruction. Some have argued that research involving preimplantation embryos should be acceptable if it can be shown that such research holds scientific promise and therapeutic benefits. According to proponents this should be the governing principle behind decision regarding such research. But a principle that says that something should not be done unless there are strong reasons for doing it is in fact no principle at all. It claims that a limit that is set can be vitiated if there are strong reasons to do so. But this means in the final analysis nothing less than the abandonment of all principled limits. This is surely the basic principle behind every form of eugenics. Furthermore, what reason could be so compelling as to give us license to destroy powerless

and non-consenting human beings, in order that we may conduct experiments on them?

In his encyclical letter on abortion, euthanasia and the death penalty entitled *Gospel of Life (Evangelium Vitae)*, Pope John Paul II spoke strongly against the use of embryos for experiments:

This evaluation of the morality of abortion must be applied also to the recent forms of intervention on human embryos which, although carried out for purposes legitimate in themselves, inevitably involve the killing of those embryos. This is the case with experimentation on embryos, which is becoming increasingly widespread in the field of biomedical research and is legally permitted in some countries. Although 'one must uphold as licit procedures carried out on the human embryo with respect the life and integrity of the embryo and do not involve disproportionate risks for it, but rather are directed to its healing, the improvement of its condition of health, or its individual survival', it must nonetheless be stated that the use of human embryos or fetuses as an object of experimentation constitutes a crime against their dignity as human beings who have a right to the same respect owed to a child once born, just as to every person (p. 113).

The use of human beings for experiments that will either do them harm or kill them, and for which they have not given their consent, should be prohibited by law. The age of the persons concerned should not be an issue; neither should be their ability to protect themselves. In the shadow of the horror of Nazism, the Nuremberg Code declared that 'no experiment should be conducted where there is an a priori reason to believe that death or disabling injury will occur'. In 1975, the Helsinki Declaration of the World Medical Association maintains that 'concern for the interests of the subject must always prevail over the interest of science and society'. Stem cell research holds great promise. But must this promise be realised regardless the ethical implications?

Surely the acids of moral relativism have not advanced so far in our culture that we will countenance the inhuman use of human beings.

Let me conclude firstly by emphasising the fact that the healing of the sick and the alleviation of human suffering have always been an integral part of the Christian tradition. The best Christian tradition has always understood medical and other sciences as aspects of the workings of God's grace in our world. But the Christian ethic of love insists that means are as important as ends, and that noble ends must never be achieved by ignoble means. Secondly, I would like to stress that I do not reject all stem cell research, but only those which result in the destruction of human beings. Stem cell lines from adult marrow and umbilical cord blood provide continuous supply of stem cells for research. These provide research material without harming or killing a human being.

**Dr Roland Chia** lectures in systematic and historical theology at Trinity Theological College. He is also the Director of the Centre for the Development of Christian Ministry and editor of *Church & Society*. Dr Chia also serves in the Life Science Study Committee of the National Council of Churches in Singapore.