

# Reproductive cloning

by Pete Moore

Generating human clones could step out of the pages of fiction and into reality if fertility specialists such as Italian medic Severino Antinori have their way. The possibility was indicated by the 1996 birth of the first mammal cloned from an adult cell, but the vast majority of people believe that human reproductive cloning would be either unwise or unethical, and UK legislation is attempting to ban it.

Dolly the cloned sheep was born on 5 July, 1996 and was introduced by the publication of a paper in *Nature* on 27 February 1997.<sup>1</sup> Since then ethicists, scientists and policy makers have struggled to make sense of the implications and determine whether the initial reaction against the notion of extending the technique to clone human beings was simply a 'yuk-factor' that could be ignored, or had a more substantial basis.

One of the confusing aspects about any discussion involving cloning is that the term is used to describe many different concepts.

When molecular biologists talk about cloning, they are normally referring to making identical copies of specific stretches of DNA. Plant biologists talk of cloning when they take cells from one plant and generate a new individual. In reproductive biology early non-human mammalian embryos have been divided into numerous individuals before being placed in a uterus, resulting in the birth of genetically identical clones.

Another variety of cloning involves taking a cell from an adult mammal and combining it with an egg that has previously had its chromosomes removed. The process is also referred to as cell

nuclear replacement (CNR) and the resulting cell starts to grow in the same way as a fertilised egg. The cells from this developing embryo could then be used for medical therapies. But the embryo could also be used to generate a new individual.

The fact that the cell donating all the chromosomes comes from an adult mammal, raises the possibility that scientists could use this to bring into being people who are genetic replicas of existing human beings.

Policy makers around the world have been quick to state that no-one should use CNR on human subjects. The UK government has spoken of its desire to ban the action, but a 15 November 2001 High Court ruling showed that current legislation was not capable of regulating cloning.

Emergency legislation rushed through both houses of parliament at the end of November closed some, but by no means all, of the loop holes concerning reproductive cloning. The legislation makes it an offence to 'place in a woman a human embryo which has been created other than by fertilisation'.<sup>2</sup>

This paper looks at the science of reproductive cloning and the practical and ethical arguments that show that reproductive cloning should not be allowed.

## Nuclear transfer

Since the 1970s scientists have been able to create tadpoles by taking nuclei from adult skin cells, placing them inside specially prepared eggs and culturing them. This raised the possibility of creating new life using the genetic material from adult cells.

At issue was the fact that as an individual grows from the initially fertilised egg, cells become specialised to form particular tissues. This process of specialisation involves permanently disabling many genes within the cell's chromosomes. To take one of these cells and use it to form a new individual would require reversing the disabling mechanism. Most scientists thought that the chances of doing this were remote at best, if not impossible in mammals.

Working at the Roslin Institute in Midlothian, Scotland, Ian Wilmut and colleagues proved that it was possible. They took an egg from a Scottish Blackface ewe and removed its nucleus. At the same time, they placed cells from the udder of a 6-year old Finn Dorset ewe into

a culture medium that had a low concentration of nutrients. This had the effect of causing the cell to become quiescent – to become dormant. The scientists then used pulses of electricity to join the ‘empty’ egg and dormant cell. The resulting ‘clone’ started to grow and after six days was placed in the uterus of a third sheep – another Scottish Blackface. One hundred and forty days later the lamb was born.

In the paper that reported this remarkable event, the scientists point out that this lamb was the only survivor of 277 fused eggs and cells.

Reports of subsequent work from other laboratories around the

world indicate that clones have severe problems with excess water retention and that those which survive and develop to birth are often deformed or weak, with many having difficulty breathing.<sup>3,4</sup>

## Reasons for opposition

Debates surrounding human cloning have been intriguing because most people approach them with an underlying feeling of anxiety and even revulsion, but are not capable of grounding these emotions in solid argument. While such ‘yuk factors’ can act as an initial guide, they are poor substitutes for a rigorous assessment of the technology.

We will see that many of the arguments do not alone present complete reasons for banning cloning, but together amount to a strong case for prohibition.

## Safety

Medical ethics recognises the need to ensure that any action carried out on a human being has a high probability of not causing harm. The poor success rate currently experienced by people involved in cloning mammals indicates that the technique is highly dangerous, and that there is no foreseeable prospect of the dangers being removed.

In fact, additional research is revealing more problems. One is that somatic cells accumulate mutations through a person’s life, so these mutated gene-sets seem to be an unwise source of genetic material for a new individual.

In addition, our developing understanding of genomic imprinting, where specific genes are turned off within cells, shows that the chromosomes contained in donor cells come with a history that can not be totally erased. A person

inherits a complete set of genes from each parent and genomic imprinting determines whether the paternal or maternal version of particular blocks of genes are used. A person can, for example, suffer from learning difficulties if this system is disturbed.

Part of the history that the donor cells carry is their age. The newly cloned individual starts out in life with a DNA that is many years old, and there is distinct possibility that the clone will age prematurely.

Together this caused the head of the team that created Dolly, Ian Wilmut, to say ‘How can all the potential hazards be identified and quantified so that we know in advance what the risks would be if anyone did attempt to clone a human being? They can’t.’<sup>5</sup>

In addition to anxieties about the safety of any child, there is also a need to consider the potential mother. Her safety is also threatened by the possibility of an atypical pregnancy and the emotional trauma caused by a child who has deformities that she may feel at least partly responsible for.

## Status of embryo

Reproductive cloning again raises questions about the status of the embryo. At the very least, almost all Christians agree that the human embryo should be afforded a special status, a concept that is also recognised in the Human Fertilisation and Embryology Act 1991.

Intentionally destroying the many embryos that will be needed to conduct research, strongly suggests that this work is being conducted in an atmosphere that gives little or no moral status to the embryos.

## Image of God

Christian theologians agree that a critical aspect of being human is the idea that we are made in the image of God. They find it harder to define what this means in practice, but there

## Why would you want a clone?

People give a variety of reasons for suggesting that they would like to create clones. They include to:

- overcome fertility problems
- produce a sibling who could donate tissue to an existing unwell individual
- replace a child who has been killed in an accident or through some disease
- enable homosexual couples to have children that are genetically related to at least one of the partners
- duplicate a particularly talented individual
- satisfy curiosity and seek fame as the pioneer of the technique
- fulfil the beliefs of a religious cult

are a number of useful pointers. A Christian's understanding of God is that while he is one person he is also made up of three – Father, Son and Holy Spirit. Referred to as the mystery of the Trinity, it shows that God is a community in which three differing individuals relate closely to each other.

An implication of this is that being human requires us to be in relationship with other people who are necessarily different from ourselves. Cloning would seem to undermine this in that we would be generating people who have lost part of their difference.

No longer would a person start as the union of a man's sperm and a woman's egg, but by a sort of asexual process that some people claim has similarities to budding. This would break the God-given system of sexual reproduction. It denies the asymmetry of marriage where male and female come together in a binding relationship that in part reflects the binding relationship shown in the Trinity.

Producing the next generation by fusing genes from two individuals has practical as well as symbolic significance. Sexual reproduction creates genetic variety and stability, and there is every reason to believe that any mass use of cloning would lead to a damaging loss of genetic diversity within the human race.

The biblical understanding of human beings is also that they are best served by living in families where children are brought up by a loving father and mother. Clones would cause a crisis within the systems of relationships that make up families. The offspring's biological parents would be the parents of the donor. If the donor was one of the nurturing parents this would mean that the biological parent would in fact be the grandparent.

Reproductive cloning would separate biology from familial relationships and demand a redefinition of a parent. Most observers believe that this relational dysfunction would have profound

implications for the individuals concerned and for the society in which they live.

## Twins

Some people say that there is nothing wrong with cloning because it

separates procreation from reproduction. It attempts to take full control over the process of reproduction. Many Christians believe that part of human dignity derives from the 'divine lottery' that establishes the set of genes each of us receives, and that cloning is problematic because it seizes too

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happens naturally in the formation of identical twins. There are however several critical differences.

With identical twins, the siblings are born at the same time and grow up together with neither twin forming the role-model against which the other can be judged. Cloning would lead to a situation where the 'twins' are born perhaps decades apart. The clone would then live in the shadow of his or her donor parent. Others would consciously or unconsciously look for similarities and make assumptions of the clone's character and abilities, making it hard for the younger person to live out his or her own identity.

## Intention and outcome

Human beings are invited by God to be partners in his work within creation. When it comes to our own reproduction, theologians say that our role is one of procreation. God is still the creator, but by engaging in sexual intercourse we are assisting the creative process.

To enable a healthy society, God asks that sex and procreation are kept within the boundaries of a life-long marriage relationship. Cloning

much control. They maintain that distancing intent from outcome is the only way to preserve human dignity.

## Means and ends

While you can argue that a couple has children to satisfy their desire to be parents, one reason cited for wanting to use cloning often treats the resulting child as an object needed to solve some existing problem. This could easily place a life-long responsibility on the clone to serve another's needs.

In addition, it is a fundamental principle of Christian Ethics that the end does not justify the means. We must not do evil that good may come (Romans 3:18). Using technology responsibly is part of good Christian stewardship, but we must do God's work God's way.

## False determinism

One of the myths surrounding reproductive cloning is that the technique will replicate a previously existing individual. This is dangerous, because the myth is false.

To start with, nuclear transfer generates individuals with identical chromosomes to the donor, but this

is not the total complement of the person's genes. Cells contain mitochondria, organelles that are essential components of energy metabolism. These mitochondria contain their own DNA making up about 1% of the total DNA in a cell. Clones like Dolly have chromosomal DNA from the donor, but mitochondrial DNA from the egg. As a result they are not totally genetically identical to the donor.

Even if the genes were identical the resulting person would still bear significant differences. Identical twin research shows the extent to which a person is shaped by the environment they live in within the womb and the clones would have

been nurtured in different wombs. In addition, our personalities are shaped by the events that we experience as individuals, and these can never be replicated.

In short we are not reducible to our genes, and any technology that is offered to people on the basis that it can provide replacements is peddling a fraud.

## What if clones?

Having shown that there is compelling evidence to indicate that cloning would be unwise or unethical, Christians need to state that if a person ever came into being via

cloning, God would love them as much as anyone else. Indeed, Christians should be at the forefront of accepting them, while disagreeing with the views and philosophies of those who brought them into being.

## Conclusions

The concept of human cloning raises strong reactions. The Christian contribution to the debate surrounding it needs to emphasise the dignity of human life that comes from the God who created us, the need to treat people as individuals in their own right and the fact that we have been created to live in relationship with people who are different from ourselves.

## Further Reading

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## International legislation against reproductive cloning

All legislatures that have considered the issue have chosen to ban human reproductive cloning. The following serve as examples:

### Australia

August 2001 report recommends national ban on cloning for reproduction

### Germany

1990 legislation bans all genetic research on embryos – this includes cloning

### United Kingdom

Human Reproductive Cloning Act 2001 – bans placement of a cloned embryo in a woman's womb

### United States of America

House of Representatives voted in summer of 2001 to ban human cloning. The Senate plans to vote on the issue in 2002.

### Israel

1999 legislation set a five-year moratorium on human cloning

### Japan

May 2001 legislation prohibits placing cloned embryos in a woman's womb

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