Human reproductive cloning and biotechnology: Rational, ethical and public concerns

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Previous research indicates a lack of clear international guidelines on the permissibility of embryonic stem cell research and human reproductive cloning. These studies suggest that this is the result of severe criticism from uninformed publics, whose arguments are based on misconceptions influenced by popular literature and science fiction films. However, the current research argues that public cloning attitudes that are based on real social and ethical concerns should be deployed to direct social and legal policy-making on human reproductive cloning. Addressing public concerns about human reproductive cloning is essential in exploring sound avenues for sensible biotechnology and policy-making. The research, on which this article reported, intended to give a critical evaluation of some major arguments for and against human reproductive cloning in order to establish whether or not these arguments hold up well under rational interrogation. Notwithstanding the author's critical attitude to uninformed opinions, false assumptions and unsound conclusions about the complex issue of human reproductive cloning, the author argued from the perspective that every life phenomenon is inextricably intertwined with everything else, and part of larger complex webs of interactions. Such a perspective recognised that the well-being of other human beings, including future human clones, is not only an existential, social and moral imperative but also epistemological. Against the backdrop of this perspective, critical questions arose that justified the creation of human clones in the face of possible defects and abnormalities in cloned children, as well as the possible harm to societies.

Menslike voortplantingskloning en biotegnologie: Rasionele, etiese en publieke besorgdhede. Vroeëre navorsing oor kloning wys op 'n afwesigheid van duidelike internasionale riglyne oor die aanvaarbaarheid van embrioniese stamsel-navorsing en menslike voortplantingskloning. Hierdie studies wys daarop dat dit te wyte is aan erge kritiek van die oningeligte publiek, wie se argumente gebaseer is op wanopvattings wat beïnvloed word deur populêre literatuur en wetenskapsfiksie-films. In hierdie artikel word daar egter aangevoer dat die publiek se houding, indien dit in werklike sosiale en etiese oorwegings gefundeer is, in ag geneem moet word om rigting te gee aan sosiale en wetlike besluitneming oor menslike voortplantingskloning. Die inagneming van openbare kommer oor menslike voortplantingskloning is essensieel in die soeke na rasionele en wyse beleidsbepaling en biotegnologiese oorwegings. Die navorsing waaroor hierdie artikel verslag lewer, poog om 'n kritiese evaluering van sommige dominante argumente vir en teen menslike voortplantingskloning te gee in die lig van rasionele oorweging. Nieteenstaande die outeur se kritiese benadering tot oninligte opinies, vals aannames en ongegronde gevolgtrekkings oor die komplekse kwessie van menslike voortplantingskloning, argumenteer die outeur vanuit die perspektief dat elke lewensverskynsel onontkombaar verbonde is en deel vorm van 'n groter komplekse netwerk van interaksies. Hierdie perspektief erken dat die welsyn van ander mense, insluitende toekomstige menslike klone, nie slegs 'n eksistensiële, sosiale en etiese kwessie is nie, maar ook 'n epistemologiese imperatief. Teen die agtergrond van hierdie perspektief, opper die outeur kritiese vrae oor die regverdiging van die skepping van toekomstige menslike klone te midde van die moontlikheid van defekte en abnormaliteite in gekloonde kinders, asook moontlike sosiale skade.

Introduction

The cloning of humans and the biotechnology of embryonic stem cell research will inevitably change our views of human life and the procreation of humans. Without ethical reflection on scientific and technological advances associated with human life and well-being, societies might find themselves in a bio-technocratic state that disregards the welfare of future cloned children, and encourages degraded views of humans as merely a means to medical advances, as depicted in Ishiguro's *Never let me go* (2005).

Ever since the cloning of Dolly, a sheep, in 1997, there has been ongoing debate about the impact of the technology of somatic cell nuclear transfer (SCNT) and the possibility of human

cloning. The possibility of cloning human beings in the future challenges our views on human life, biotechnology control, personal identity, human dignity, parenthood, family relations, reproductive liberty and the status of embryos. The meanings of these concepts are complex, often vague and depend on people's current cultural and religious worldviews. The biotechnology of cloning and its possible application to humans also elicits many complex questions that are difficult to answer:

- how far will humanity go in using technology to (re) produce human life?
- which ethical dilemmas does human cloning present?
- does the sacrifice of pre-embryos justify the need for medical treatment and producing transplant tissues?

The overarching question that arises from all this complexity is: how do we, as philosophers, social scientists, bioethicists and theologians, make a contribution to provide some answers to the permissibility of human cloning in order to inform the public and to direct policy-making?

A systematic review of academic literature in the field of human reproductive cloning reveals that there are differing and conflicting views on human cloning, ranging from conservative to liberal perspectives. The literature emphasises that these debates include speculations about the effects of cloning on human life as we know it and the creation of humans (Davis 2009; Evans 2002; Harris 2004; Macintosch 2005; MacKinnon 2000; Pence 1998a; Strong 2005a; West 2003). These works suggest that most arguments on human cloning are, to a large extent, built on misconceptions and false assumptions, influenced by popular literature and science fiction films, about the technology of cloning and its potential application to human beings.

Further scrutiny of human cloning literature reveals the absence of clear international guidelines on the justifiability of embryonic stem cell research and human cloning. Some authors claim that the lack of clarity on the permissibility of human cloning, and consequently the absence of clear international legislation, is the result of severe criticism from the public. This is because they are misinformed as their opinions are influenced by popular publications, the media, science fiction literature and films that portray the technology of cloning as an evil process manipulated by irresponsible scientists (Dawkins 1998; Green 2001; Harris 2004; Kitcher 2000; Macintosch 2005; Pence 1998a).

On the other hand, the argument in this article maintains that attitudes to cloning, that are based on real social and moral concerns, should be taken into consideration, to direct social and legal policy-making on human reproductive cloning and human embryonic research. In reaction to public sentiments and misconceptions, some advocates of human embryonic stem cell research (Harris 2004; Macintosch 2005; Pence 1998a & 1998b) do not take public opinion seriously. As a result, the deeper social and ethical values on which publics frequently base their opinions are ignored. The question is whether or not these advocates engage seriously in critical reflection about the difficult task of determining where and how thinking about cloning goes wrong. The debate, thus, does not reach conclusive answers about the justifiability of cloning and human clones.

Responding to this dilemma, the research on which this article reports seeks to give a critical evaluation of some major arguments for and against human reproductive cloning, in order to establish whether or not these arguments hold up well under rational interrogation. The method applied in this article is an open system of critical examination of uninformed opinions, false assumptions and unsound conclusions, with the aim to think through the complex issue of human reproductive cloning. On this premise, the author adopts a philosophical approach that is based on the Socratic principle of critical reflection and examination of problems before conclusions are drawn.

Notwithstanding my critical attitude towards unsubstantiated arguments on the complex issue of human reproductive cloning, I follow an enactivist non-linear worldview, developed by Maturana and Varela (1987) and Varela, Thompson and Rosch (1991). According to this understanding, and in contrast to atomistic worldviews, such as objectivism and idealism, every life phenomenon is seen as inextricably intertwined with everything else and forms part of larger complex webs of interaction. Such a perspective recognises that as human beings we are bound by our common humanity, and that the well-being of other human beings, including future human clones, is not only an existential, social and moral imperative, but also an epistemological imperative. Consequently, I contend that, in the context of humanity itself as a species, which is intricately part of larger complex webs of interactions, there are some basic moral principles that measure up to critical interrogation.

Against the backdrop of this perspective, critical questions arise about justifying the creation of human clones in the face of harm to cloned children and harm to societies at large.

This article intends to make a contribution in clearing away false assumptions, factual and prejudiced confusions, in order to assist in informing the public as well as policy-makers about the possible implications of the permissibility of cloning and its application to humans.

The following section deals with the technology of cloning and the concerns about its application to humans.

The technology of cloning and its concerns

To avoid misconceptions about cloning, its potential application to human beings and consequently its moral and political considerations, it is crucial to understand what cloning is. Definitions can, at worst, be deliberately politically and emotionally misleading, and persuasive at best.

When it comes to deliberations about human reproductive cloning, one should take care to define the concept of cloning as accurately as possible. Seidel (2000:17–32) points out that there are several definitions of 'clone'. The concept 'clone'

is derived from the Greek word *klon*, meaning 'twig'. The meaning of the word 'clone', in this sense, refers to the process of breaking a twig off from certain species of tree or plant and, when planted, a copy of the tree or plant will result. Another definition of 'clone' is to make a genetic copy or set of copies of an organism, that is, bisecting a mammalian embryo to form identical twins (Seidel 2000:17). This type of cloning (embryo splitting) involves a fertilised egg and is, thus, a version of sexual reproduction. Cloning can also be defined as 'fusion or insertion of a diploid nucleus into an egg (oocyte)' (Seidel 2000:17). This method is known as somatic cell nuclear transfer (SCNT) and refers to asexual reproduction because no fertilisation is involved. This was the cloning technology Wilmut and his colleagues at the Roslin Institute in Edinburgh used in order to clone Dolly (Wilmut *et al*. 1997).

For the purpose of the research being reported here, the following definition will apply to cloning with reference to human cloning: Human cloning is human asexual reproduction achieved by way of the SCNT technique to produce a living human organism (at any stage of biological development) that is genetically identical to a human donor.

Human cloning, according to the above definition, thus entails a procedure of taking a cell nucleus from an adult donor (female or male) to be cloned and then, using an electric current, fusing it with an empty egg cell taken from a female subject. A blastocyst starts to develop and divides into many cells (Potton 1997; Thomson *et al*. 1998; Wilmut *et al*. 1997).

In theory, SCNT could be applied for human reproductive purposes. Jaenisch and Wilmut (2001:2552) state that it is possible to clone humans, but 'attempts to clone human beings at a time when the scientific issues of nuclear cloning have not been clarified are dangerous and irresponsible'. In this case, a viable embryo created through SCNT technology would be implanted into a viable womb, and under the right conditions, it is possible that a child, who is genetically related to the DNA source, would be born as a result.

Since the cloning of Dolly, the technology of human embryonic stem cell research and cloning techniques has advanced rapidly. This has led to a shift in the way scientists, philosophers, theologians, ethicists and policy-makers think about human cloning and its implications. There is awareness in scientific communities that human reproductive cloning is no longer just a probability but that the cloning of humans is inevitable (Davis 2009; Savulescu & Bostrom 2009; Stock 2003). Scientists and the medical community are optimistic that sooner or later the creation of human clones will be a reality.

If this view is correct, we need policies and standards of behaviour in place to deal with the challenges presented by the technique of reproductive cloning. These policies and standards of behaviour should include the following:

- regulations on the harvesting of stem cells from human embryos for medical purposes
- health risks and abnormalities to human clones resulting from inappropriate epigenetic reprogramming
- the care of and respect for people created by reproductive cloning, should this become a reality in future.

Policy-making on SCNT and human reproductive cloning should be founded on some basic principles after due consideration to the ethical and social implications of human cloning. However, as will be illustrated in the sections to follow, no consensus exists on the possible social and ethical implications of reproductive cloning. Thus, in the absence of consensus, clear social policy on human cloning would remain on the borderline of indecision, as is currently the case in the United States of America (USA) and the European Union (EU) countries. Except for the United Kingdom (UK), who adopted a liberal position, EU countries have adopted no legislation, but have banned human cloning and the creation of human embryos for research purposes. On 22 January 2001, the UK adopted a liberal position and became the first country to approve human embryonic stem cell research. The USA followed the EU and adopted no clear social policy, but ten states have passed laws restricting research on human embryos, foetuses and unborn children (Harris 2004:122).

Considering the above legal advances, there is a need for critical reflections on debates about the act of human cloning in an attempt to direct policy-making. Consequently, the significance of critical examination of the underlying assumptions and prejudices in arguments on human cloning cannot be underestimated.

In the sections to follow, I give a critical exploration of some major arguments for and against human cloning. These have the aim of determining whether or not they uphold the test of rational, social and ethical deliberation about justifying the creation of human clones in the face of possible defects and abnormalities in cloned children as well as possible harm to families and societies.

Arguments against human reproductive cloning

The view, that reproductive human cloning is wrong, can be divided into two broad categories:

- arguments based on harm to the cloned child
- arguments based on harm to societies.

Broadly speaking, the arguments in the first category entail concerns about the uniqueness and identity of the cloned person, and the argument about safety, that concern the potential health risk to cloned children. Arguments from the second group involve concerns about class, gender and race injustices, the meaning of procreation, parenthood and that effects on family relations as well as concerns about harm to societies.

Arguments based on harm to the cloned child

The argument about harm to cloned children entails that human reproductive cloning is wrong because the uniqueness and identity of cloned persons are at stake.

The argument concerning uniqueness and identity

Some opponents of human cloning have claimed that human cloning is wrong because it jeopardises the cloned person's uniqueness and identity. Shortly after the cloning of Dolly, Rifkin (in Kluger 1997) stated:

> It's a horrendous crime to make a Xerox of someone ... For the first time, we've taken the principles of industrial design – quality control, predictability – and applied them to a human being. (p. 70)

Some other authors (Annas 1998; Baird 1999; Holm 1998; Kass 1997, 2002; McKibben 2003; Williamson 1999) express similar concerns by referring to human cloning as 'life in the shadow', 'disregard of the right to a unique genetic make-up', 'diminishing of the clone's sense of uniqueness' and the challenge of 'staying human in an engineered age'.

Some of these objections are based on the belief that cloning involves the creation of an identical copy of the original DNA donor and, therefore, the cloned person would not be a unique person. This perception may come from representations of human cloning in science fiction films, popular literature, newspapers, and sensationalist journalists. For instance, on the front pages of many magazines that introduced the world to Dolly and communicated the technology of human cloning, two identical copies of babies were portrayed. What many people read into this is that human cloning is the act of making an identical copy of the original person. Although a human clone may have the same nuclear genes as the donor, it is not correct to think that he or she would be an exact replica of the adult donor.

In reply to the concern about uniqueness and identity of clones, Lewontin (2000) and Strong (2005a) maintain that this concern rests on the fallacy of biological determinism, which is based on the supposition that organisms are completely determined by their genes. They argue that the cloned person is identical to its donor in its genetic constitution, but not in the phenotype, that is, in the molecular structure, the formation of the brain, and everything that comes from the physical, socio-political and cultural environment that constitutes the uniqueness and identity of an individual. Lewontin (2000:37) maintains that the question of uniqueness and identity entails a misunderstanding of developmental biology, where 'gene' is substituted for 'person'.

In addition, researchers on monozygotic twins (Bouchard 1997; Eley, Gregory, Clark & Ehlers 2007) maintain that, even when there are IQ or mental disorder similarities in twins, their behaviours, cognitive abilities and personalities are not the same, and they differ according to individual experiences. On this point, some authors (Johnson 1997; Pence 1998b; Strong 2005b) emphasise that the experiences of a person cannot be replicated by cloning.

To a certain extent, the above arguments succeed in pointing out errors in reasoning concerning genetic determinism and its extrapolation to psychological and social consequences. However, is pointing out the errors in reasoning sufficient to argue against the fact that the identity of the clone may be violated, based on the fact that the genome of the cloned child is known (determined) in the sense that another person (known person) has the same genome?

Whilst I agree that a clone would not be an identical copy of the original donor, that organisms are not completely determined by their genes and that the experiences of a person cannot be replicated by cloning, I concur with Fukuyama (2002), Holm (1998) and McKibben (2003) that the identity of the clone may be violated. This is based on the fact that cloning produces a human being with a known genome, 'determined' by those who are involved in the cloning of this human being, and who have certain hopes and expectations about the characteristics of that person. If we adopt the view that the indeterminedness of the genome is a biological substrate for the equality and reciprocal freedom of human beings, then cloning human beings, whose genomes are determined, calls into question the philosophical and ontological problem of uniqueness and identity.

Considering the arguments for and against human cloning, in the light of concerns about the uniqueness and identity of clones, it can be concluded that there is a rational, ontological and moral basis to claims that cloning humans could compromise the uniqueness and identity of clones.

The argument based on safety

Another argument against human cloning is the argument based on safety. This reasoning claims that the technology of cloning has not been proved to be safe and the potential risk of harm to the cloned child is too high to justify human cloning (Dawkins 1998; Jaenisch & Wilmut 2001; Kitcher 2000; Murray 2001; NAS 2002; NBAC 1997). Both the National Bioethics Advisory Commission (NBAC) of 1997 and the National Academy of Sciences (NAS) of 2002 in the USA, called for a prohibition of the creation of an actual human being through the procedure of SCNT, based on safety considerations.

There are good grounds for the argument against human cloning based on safety concerns. To date we do not have sufficient scientific and medical evidence that cloned persons would not suffer from deformities and abnormalities as a result of errors in epigenetic reprogramming. The argument based on safety is both a practical and ethical concern, because creating humans in the face of health risks and abnormalities would be unethical. The creation of human clones with defects and abnormalities flies in the face of concern for their well-being, future generations and humanity as a species. These all form part of multidimensional webs of co-existence.

To my mind, the argument based on safety is justifiable. Even if it could be claimed that every new technology is imperfect (Pollack 1993) and that no reproductive technology can guarantee a child's exemption from defects (Pence 1998a), SCNT technology remains to be proved safe for humans. A deeper discussion on the argument based on safety follows later in this article.

Whilst some opponents of human cloning argue that it would harm the cloned child, other opponents argue that it would harm society at large (Cole-Turner 2001; Fukuyama 2002; McKibben 2003).

Arguments based on harm to society

Arguments based on harm to society entail concerns about class, gender and race injustices, and the meaning of procreation, parenthood and the effects on family relations.

Concerns about class, race and gender injustices

Some opponents of human cloning (Cole-Turner 2001; Fukuyama 2002; McKibben 2003) associate it with genetic engineering. The concern here is that the scientific knowledge of somatic cell nuclear transfer could be abused to produce children of certain chosen class, race or gender types. This, they argue, could lead to social injustices, such as class, race and gender discrimination and, thus, harm societies at large. In an attempt to counter-argue the concern about race, class and gender injustices, Macintosch (2005:40) opines that 'a genome that contributed toward the development of a person with particular traits and characteristics could never produce the same individual.' However, to my mind, Macintosch's argument does not address the issue at hand. Although there is no one-to-one relation between genes and individuality, cloning can result in race, gender and class injustices. For instance, cloning from a White intelligent male will result in clones that are White, male and probably intelligent. Moreover, if cloning is combined with a selection of clones who are from a genetic pool of White intelligent males, irrespective of their individual traits and personalities, clones will result in race, class and gender injustices.

Another argument against the concern about race, class and gender injustices comes from Silver (1998:171), who maintains that even if the rich and racially obsessed could afford to bear children by cloning, it would have a negligible impact on race, class and gender stratification. To my mind, Silver argues from an economical point of view, whereas the argument from race, class and gender injustices pertains to social and ethical concerns. In response to Silver's view point, one could ask: What if the technology of human reproductive cloning becomes efficient, legal, and popular amongst all the moneyed classes? In this case Silver's argument would fail.

Considering the above arguments for and against human cloning and concerns about class, race and gender injustices, it can be concluded that there are sufficient grounds (rational, social and moral) to claim that cloning could compromise race, class and gender stratification and jeopardise equality. Consequently, cloning could lead to social injustices and harm societies at large.

The argument concerning the meaning of procreation, parenthood and the effects on family relations

Some opponents of human cloning (Bruce 1998; Gosden 1999; Paris 2001) argue that there is a difference between 'begetting' and 'making' children in terms of procreation. According to this view 'begetting' refers to the act of creating and conceiving children through sexual reproduction, whilst 'making' refers to the production of children through a technique of selecting and controlling children's genotypes, as in the case of human reproductive cloning (Bruce 1998). Moreover, Paris (2001:46) contends that human reproductive cloning would lead to treating cloned children as 'mere objects of utility'. The underpinning assumption, in this reasoning, is that cloned persons would be less human ('mere objects of utility') because of the technique used to 'produce' children.

To my mind, the difference that is drawn between 'begetting' and 'making' children is obfuscated. The 'making' of children also includes the assisted reproductive technology of in vitro fertilisation (IVF). After many years of the existence of this technology, of 'making' children, there is no conclusive evidence (empirical, social or ethical) that people who use IVF treat their children as mere manufactured objects and, thereby, there is no evidence that this affects family relations negatively. Likewise, it could be argued that there is no rational ground to believe that people who use the assisted reproductive technique of SCNT would treat their children as mere objects of utility and that this, thereby, would affect family relations negatively.

In response to the question of the meaning of reproduction, parenthood and the effects on family relations, I propose that this issue is approached from the angle of deeper philosophical, social and ethical questions about the fact that cloned children would be human beings with determined (known) genomes. Considering this perspective, it is the 'determinedness' of human clones that gives rise to concern. I discussed the issue of 'determinedness' earlier and will not further elaborate on this point here. Given the fact that the cloned child would have the same genome and hence a special link to only one parent, it follows that human cloning could complicate parent and family dynamics. To my mind, parenthood and family relations do not occur in isolation, but form part of larger webs of existential, emotional, social and cultural relations and interactions. For instance, if a clone is born who has the same genome as the 'father', how should the parents, family, friends, society and the law relate and treat the child? Is the parent (the 'father') who donated the genes the father of the child, or is he the brother of the child? In my opinion, these concerns are not overstated or mere speculations as Macintosch (2005) and Harris (2004) would have us believe, but real social and ethical concerns about the possible negative impact of human cloning on reproduction, parenthood and family relations.

Considering the arguments for and against human cloning in the light of concerns about the meaning of reproduction, parenthood and family relations, it can be concluded that there is a rational, social and moral basis to claim that cloning humans could compromise family relations and blur generational boundaries.

In summary, a critical examination of arguments offered in support of concerns about the effects of human cloning on

uniqueness and identity, class, race, gender injustices, the meaning of procreation, parenthood and family relations, has shown that these arguments do stand the test of rational deliberation, rather than being built upon emotional reactions and false understandings of human cloning.

Arguments for allowing human cloning

In the section to follow, I will discuss two main arguments for the permissibility of human reproductive cloning. The first is based on individual choice and reproductive liberty, and the second focuses on the medical benefits of cloning. The aim is to establish whether or not these arguments uphold the test of rational, social and moral concerns.

Individual choice and reproductive liberty

The argument that is based on individual choice and procreative liberty entails that a prohibition on asexual human reproduction, such as in vitro fertilisation (IVF) and artificial insemination, is a violation of the constitutional protection of procreative liberty. In almost all countries worldwide, the constitutional protection of procreative liberty states that individuals have the freedom to decide whether or not to have children.

It is argued that in democratic societies, the government cannot control people's decisions about procreation, nor can it dictate how and why people should procreate, or how many children they should have. Furthermore, the argument states that there are many infertile people, gay persons and individuals who do not prefer sexual reproduction but who wish to have children, but cannot do so. Those who follow the logic of this argument maintain that the liberty and moral interests of these groups of people must be taken into account. Ostensibly, these liberties and moral interests are founded on the following premises: People choose or desire to have children for all kinds of reasons:

- to have a family and companionship
- to have descendants for the continuation of the family lineage
- as a status symbol
- to live up to societal norms and expectations
- to prove adulthood
- to attempt to save a marriage.

Thus, it is argued, the reasons for people to want children are a matter of privacy and individual choice. On the basis of this, proponents of human reproductive cloning (Harris 2004; Macintosh 2005; Pence 1998a & 1998b) claim that moral and legal prohibition of new technologies of reproduction would be an unconstitutional infringement on people's individual choice and procreative freedom. This is because it would deny them access to new methods of procreation.

I have a number of problems with this argument:

- Firstly, the argument confuses the technology of human cloning with the actuality of cloning humans.
- Secondly, the central issue in deliberations on human cloning is about cloning and not about the right to procreation.
- Thirdly, restrictive legislation on the technology of human cloning does not imply an unconstitutional violation of people's reproductive liberty. The reason for this is clear: state control of the technique of reproduction does not equal annihilation of people's freedom to procreate.

The argument based on medical benefits

The argument based on medical benefits maintains that cloning combined with stem cell technologies (also labelled 'therapeutic cloning' by some scientists) has significant therapeutic value and medical benefits. These include enhancing the process of discovering new medicines for alleviating illnesses such as Alzheimer's, Parkinson's, Huntington's, Lou Gehrig's disease, heart diseases, lymphoma, leukaemia, diabetes, anaemia and the partial restoration of damaged spinal cords. Moreover, it is claimed that therapeutic cloning offers promising ways of supplying organs and tissues, such as new livers, hearts, nerve cells and bone barrow for transplants. However, all these proclaimed medical benefits are in need of empirical verification.

Because both human reproductive cloning (also known as baby cloning) and therapeutic cloning (also known as research cloning) involve stem cell cloning and are both by definition forms of reproduction, a distinction between them is important when it comes to their research effects and ethical considerations. The distinction I draw, between the two technologies, pertains to intention and source. The intention of human reproductive cloning is to reproduce humans, whereas the intention of therapeutic cloning is not to create babies, but to discover new drugs for the treatment of medical disorders. Furthermore, in the case of human reproductive cloning, the source from which stem cells are derived is from an adult human donor, for instance, these are extracted from the donor's bone marrow or muscle tissue. The donor is not terminated in the process. In therapeutic cloning, stem cells are 'mined' from human (or animal) embryos which are then destroyed in the process. This state of affairs raises important ethical questions, similar to the problem of abortion. However, an analysis of the ethical considerations of therapeutic cloning falls outside the scope of this article. Here, I give an analysis of the argument that claims that there is nothing wrong with the cloning of embryos for medical benefits.

Some supporters of therapeutic cloning (Vogelstein, Alberts & Shine 2002; West 2003) argue that there is nothing wrong with the cloning of embryos for medical benefits, because at the blastocyst stage of development embryonic stem cells are simply clumps of cells and there is a vast difference between a pre-embryo and an actual human being. West (2003:91) insists that the creation and destruction of a pre-embryo does not amount to the destruction of a human, because it is not a human being. According to West then, therapeutic cloning should go ahead.

On the other hand, the question can be asked whether or not West (2003), in his moral and legal perspective on therapeutic cloning, has considered the ethical justifiability of creating embryos as sources for stem cells and the morality of experimentation on human embryos. In fact, the actuality of cloning has also brought about the ethical dilemma of creating embryos and then discarding them.

Moral debates on this issue revolve around the question of the biological and moral status of the embryo. This issue re-opens the whole debate on the moral justification of abortion and the problem of whether or not an embryo is a human life. These questions have been extensively discussed by social scientists and philosophers (see for example Espejo 2002; Feinberg & Feinberg 2010; Steinbock 2011; Van Niekerk & Van Zyl 1996). For this reason, the research reported in this article did not examine these issues.

It is a fact that moral issues about therapeutic cloning are complex and nebulous. On the one hand, scientists, medical doctors and healthcare workers are faced with the obligation to serve humanity by applying their biological and medical research findings and knowledge to reduce human suffering and alleviate medical conditions. On the other hand, the sacrificing of human embryos for the benefit of others remains an important and debatable issue.

In order to put all the relevant issues into perspective, I will give a synthesis of the differing and often conflicting arguments regarding human reproductive cloning that have been examined in the current research. My analysis of arguments against human reproductive cloning has shown arguments based on uniqueness and identity and those based on concerns about class, race and gender injustices, offered in support of concerns about the effects of human cloning on uniqueness and identity, class, race, gender injustices, the meaning of procreation, parenthood and family relations. My analysis has shown that these arguments are based on real social and ethical concerns, rather than on emotional reactions and misunderstandings of the technology of cloning and its application to humans.

The examination of the argument based on individual choice and procreative liberty has shown that restrictive legislation on human cloning does not necessarily violate reproductive liberty. I pointed out that the argument confuses the issue of social and ethical acceptability of human cloning with the professed right to procreation. To my mind, the argument based on procreative freedom is found wanting in substantiation of a rational and moral basis to support a liberal belief in human control in the face of safety risks to clones and society at large. In fact, if states can show that they have a rational basis for adopting restrictive legislation on cloning, their decision would override people's wishes to procreate through the technology of cloning humans.

The discussion on the argument based on medical benefits revealed that therapeutic cloning brings forth complex moral dilemmas about the issue of sacrificing human and animal embryos for the benefit of others. These moral dilemmas are extremely difficult to resolve, given that there are differing and conflicting views on when human life begins.

If it is a fact that there is not adequate scientific proof that the cloning technology would be safe for cloning humans, it follows that any attempt to clone humans for the purpose of creating children is irresponsible and unethical, despite the advocates of human reproductive cloning who try to argue against this viewpoint (Pence 1998a; Pollack 1993; Macintosch 2005).

Here, I want to single out Macintosch's view. Macintosch (2005:45) rejects the argument based on safety on the basis that 'safety has achieved prominence as a secularised objection to a technology that is unpopular for religious and other reasons'. She claims that she does not believe that 'safety concerns are the primary force motivating public and political opposition to cloning and human clones' (Macintosch 2005:44) and asks whether or not there is any *scientific* basis for upholding safety concerns.

This brings me to an issue that was raised earlier in this article. The point was made that attitudes to cloning, that are based on real social and moral concerns, should be taken into account to direct policy making on human reproductive cloning. This is the topic of the section to follow.

Social and moral concerns of the public

Responding to Macintosch's insistence on a *scientific* basis for justifying the view of safety concerns (Macintosch 2005:44), I want to point out that the controversies and tensions engendered by new technologies in the field of human embryonic stem cell research and the belief in the inevitability of human reproductive cloning do not merely involve the possible *scientific* successes or failures, but also the social and ethical implications of its aims and successes.

In support of this reasoning, a number of authors (Bates *et al*. 2005; Gaskell, Allum & Stares 2003; Morris & Adley 2001; Nisbet 2004; Priest 2000; Shepherd *et al*. 2006), who reviewed poll results on public opinion about stem cell research and human cloning in the USA, UK and EU countries, have pointed out that the use of statistical evidence alone is not enough to arrive at conclusions about public concerns. These authors maintain that it is necessary to go beyond quantitative poll results to understand public attitudes to cloning.

This argumentation gave rise to focus group studies in the USA, UK and European countries (Bates *et al*. 2005; Gaskell *et al*. 2003; Morris & Adley 2001; Priest 2000; Shepherd *et al*. 2006) as a means of qualitative measurement to address public concerns about cloning and human clones. These authors attempted to show why the public is opposed to cloning. From their focus group studies, they (Bates *et al*. 2005; Shepherd *et al*. 2006) reported that the public has real social and ethical concerns about cloning and human clones, which

are not necessarily based upon misunderstandings of genetic technology. Results obtained from these focus group studies show that public concerns about cloning and human clones are founded on deeper underlying social and ethical values or beliefs, such as respect for human life (extending as far back as the moment of conception and taking into account the status of the embryo) and respect for the natural order of things (extending to future generations) (Bates *et al.* 2005:334; Nisbet 2004:145; Shepherd *et al*. 2006:11). In fact, these studies have shown that the issues of interference with nature, with reference to safety concerns and the status of the embryo, were the most frequently drawn-upon values or beliefs upon which respondents based their concerns (Bates *et al.* 2005:334; Shepherd *et al*. 2006:11).

In addition, research conducted by Bates (2005), which was based on 25 focus groups convened to explore the lay public's understanding of cloning and human clones, has shown that the articulation of public concerns about cloning and human clones is far less influenced by mass media, popular publications, science fiction literature and films than advocates, scientists and policy makers make us believe. In his study, Bates (2005) indicates that publics draw upon their own personal frames of reference and moral frameworks to bear on their understanding of genetic science and their opinions on the permissibility of human reproductive cloning. He says that 'too many studies assume a paradigm of "garbage in, garbage out"' (Bates 2005:60). He further argues that people are not computers. Rather, publics process information about genetics and human cloning in a complex and critical way according to their personal and cultural frames of reference (Bates 2005:47; Shepherd *et al*. 2006).

On the basis of these studies and in consideration of arguments based on concerns about the safety and well-being of future cloned children, family relations and society at large, the reasoning in this article maintains that the moral and ethical dimensions of biotechnology, that underlie public concerns about cloning and human clones, need to be taken into account to direct social and legal policy making on cloning and human reproductive cloning. Maienschein (2005) emphasises that the research findings and viewpoints of biologists and scientists alone are not enough to give us the wisdom we need to guide our political and social decisions about human cloning. Perhaps we could adopt some basic social and moral principles founded on social and ethical values, such as respect for human life, respect for the natural order of things, and consideration of safety concerns. However, given the fact that we live in a pluralistic postmodern society, where people have differing and conflicting views, consensus about social and moral principles would be a complex issue.

Accordingly, the question arises: How do we, as philosophers, theologians, ethicists and social scientists, make the wisest medical and bioscience policy we can about human cloning and SCNT? According to Maienschein (2005), the crucial issue we learn from the history of biology, science and morality is the following:

> There have been many views of life and many ways to define when a life begins, just as there still are and always will be. The questions have changed as our science has advanced, and the answers have had to be renegotiated in the light of accumulating knowledge. Any policy answer should be grounded in the best available current science and the best moral thinking—and in the knowledge that science and morality are not intrinsically at odds. (p. 301)

Moreover, Du Plessis (2006:61) makes the point that wisdom entails knowing *how* to apply science and knowledge wisely. He points out that 'science implies knowledge with a responsible conscience'. The swift advances of biotechnology in the field of human embryonic stem cell research give scientists the power to transform the world and human life. Some scientists have adopted the attitude that moral discourse from lay people and critical debates of philosophers and ethicists are pure speculations and theorising and can, therefore, be ignored in policy-making. Such science does not imply 'knowledge with a responsible conscience' (Du Plessis 2006:61).

Conclusion

The preceding discussion revealed that critical debates by philosophers, ethicists, theologians, scientists and bioethicists are crucial to clear away false assumptions, factual and prejudiced confusions about cloning and its application to humans. I have demonstrated that such critical discourses would be valuable to inform the public and policy-makers about the possible implications of the permissibility of human embryonic research and human cloning.

Implications of the findings of this research include the debate about the importance of the inclusion of public social and moral concerns in deliberation of policy-making on cloning and human reproductive cloning. It is in the interest of humanity and future generations to clarify the confusions surrounding the technology of cloning and its application to humans, in order to prevent harm to future human clones and to guide sensible biotechnology and associated policy-making. The application of cloning to humans remains a health and moral concern because cloning needs to be tested on humans in order to verify its risks.

This research will contribute to an increased clarity surrounding the technology of cloning and possible implications of the permissibility of human embryonic research and the cloning of humans. Future research in this regard would be useful to open up sound avenues to explore the interrelated issues of well-informed opinions on human cloning, public opinion, sensible biotechnology and policy-making on cloning and human reproductive cloning.

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