Embryos, cells and God

Different religious beliefs have little consensus on controversial issues such as cloning and stem-cell research

Earlier this year, South Korean researchers were the first to successfully clone human embryos and create a pluripotent embryonic stem cell from one of the cloned blastocysts (Hwang WS *et al* (2004) *Science* **303**: 1669–1674). In December 2002, the Raelian religious sect claimed to have cloned the first human baby, albeit without any supporting proof. These episodes—and several other studies and claims—have triggered enormous public interest in the possibility of cloning humans, a topic that goes to the heart of most people's ideas and convictions about humanity and morality. Not surprisingly, organized religion, particularly the Christian Church, has taken a strong interest in the cloning debate. It has sent priests and bishops, pastors and preachers to the pulpit, issuing strong words of caution or outright condemnation of any research that creates, uses or destroys human embryos. This has had a strong influence on science policy: many Western countries in which Christianity is prevalent have banned human cloning and the creation of human embryonic stem-cell lines, or have at least issued strict regulations for such research.

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Nevertheless, religious leaders rarely speak with one voice. Although some faiths hold irrevocable positions against cloning and stem-cell research, others have found room in their beliefs and traditions to accommodate the potentially beneficial aspects of this technology. It is therefore not surprising that it was scientists from the predominantly Buddhist South Korea that first cloned human embryos, rather than biologists in the USA or Europe. In essence, different attitudes towards human cloning centre on a few fundamental questions: does an embryo hold the status of a person? Is its destruction during research a murder? Does cloning corrupt family relationships? Ultimately, does cloning mean tampering with God's creation?

The Catholic Church has become the leading voice against any form of human cloning and even against the creation of human embryonic stem-cell lines from 'excess' *in vitro* fertilization (IVF) embryos. Their prohibitive stance is based on a 1987 document entitled 'Instruction on Respect for Human Life in its Origin and on the Dignity of Procreation (*Donum Vitae*)', published by the Congregation for the Doctrine of Faith. Roman Catholics were told that cloning is categorically "considered contrary to the moral law, since [it is in] opposition to the dignity both of human procreation and of the conjugal union." Any attempts at cloning are therefore a violation of the dignity of the human embryo, which is granted the status of a person from the point of fertilization of the oocyte.

But this is a relatively recent definition of personhood in Christian tradition. The medieval church, in line with the Aristotelian doctrine, believed that an embryo acquired a soul only when it took recognizable human form. Consequently, even abortion was considered to be a minor sin in the Middle Ages, rather than a deadly sin comparable to murder. This changed in 1869, when Pope Pius IX, who was probably influenced by advances in embryological research, declared that an embryo bore full human status from the time of fertilization (Lachmann P (2001) *EMBO Rep* **2**: 165–198). Since then, the Catholic Church has stuck to this position and damned the destruction of an embryo after conception

as murder. No distinction is made between embryos that are conceived naturally and those created through IVF or cloning.

In addition, most Christian leaders strongly oppose reproductive cloning, although they accept IVF as a means of reproduction. According to Donald Bruce from the Science, Religion and Technology Project of the Church of Scotland (Edinburgh, Scotland, UK), "cloning would give someone power to predetermine the whole genetics of another person. I suggest this is a power that no one should be given. [...] It should not be for any human to predetermine another person's complete genetics" (Bruce DM (2002) *J Mol Biol* **319**: 917–925).

Other faiths are more difficult to pin down, as their positions towards science and reproductive techniques are less categorical and more diverse. Most theistic religions, for instance, strongly reject reproductive cloning because they consider life to be a 'gift' from God. Bringing into being a new human by cloning—as opposed to normal sexual reproduction—is considered to be an act against God's creation or a usurpation of the Creator's power. Buddhism, by contrast, does not have the same fundamental opposition to cloning. "Many of these theological objections disappear when cloning is viewed from a Buddhist perspective," said Damien Keown, a

Reader in Buddhism in the Department of History at Goldsmiths College, University of London, UK, and an authoritative voice on Buddhist responses to cloning and other biomedical issues.

This is mainly explained by Buddhism's view of the world and mankind's place in it, which is different from the view of monotheistic religions. There is no supreme or divine creator, whose plan might be distorted by human tinkering with nature. In addition, Buddhists believe that the creation of life is not a fixed or unequivocal process. "Buddhism teaches that life may come into being in a variety of ways, of which sexual reproduction is but one, so sexual reproduction has no divinely sanctioned priority over other modes of procreation," explained Keown. Life can therefore begin in many ways and, theologically, cloning would not be seen as a problematic technology. Furthermore, in contrast to other mainstream religions, Buddhists regard human individuality as an illusion or mirage. Cloning would therefore not threaten or devalue the personality or character of an individual.

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But Buddhism's view on using stem cells from embryos is not so clear. It encourages placing a strong value on respecting every living being, which includes fertilized embryos that are used for, or originate in, research activities. Yong Moon, the lead author of the South Korean cloning paper and a gynaecologist at the University of Seoul, praised the potential therapeutic benefits arising from his studies. Speaking at the 2004 Conference of the American Association for the Advancement of Science in Seattle (WA, USA), he said, "cloning is a different way of thinking about the recycling of life. It's a Buddhist way of thinking." However, "I'm afraid I would have to disagree with Dr. Yong Moon's comments," countered Keown. "Since therapeutic cloning involves experimentation on immature human beings, it might be thought clearly contrary to Buddhist ethics."

Islamic scholars, when considering the ethics of stem-cell technology or reproductive cloning, often seek guidance in religious texts, mainly the Qur'an. But in the absence of a central institution, such as the Vatican, there is a plurality of independent ethical or jurisdictional opinions on the Shari'ah, the religious law of Muslims. There is no agreed consensus on the moral status of the embryo among the various schools of Islamic thought, but many believe that it acquires a soul 120 days after fertilization, towards the end of the fourth month of pregnancy. In addition, the Shari'ah makes a distinction between actual and potential life, determining that the former should be afforded more protection than the latter. Under most interpretations, the embryo is therefore not considered to be a person and using it to create stem-cell lines would not violate Islamic law.

Nevertheless, Islamic law remains concerned with reproductive cloning procedures, and particularly their impact on inter-human and familial relationships. "Islam regards interpersonal relationships as fundamental to human religious life," said Abdulaziz Sachedina, Professor of Islamic Studies at the University of Virginia (Charlottesville, VA, USA) and a leading scholar of Islamic views on cloning. The preservation of the parent-child lineage is of utmost importance to Muslims, as are the spousal relationships that encourage parental love and concern for their children. "[The] Muslim focus of the debate on genetic replication and embryonic manipulation is concerned with moral issues related to the possibility, through these technologies, of creating incidental relationships between a man and a woman without a spiritual and moral connection between them," explained Sachedina. Muslims would therefore endorse reproductive cloning to help infertile couples only if it is within marital bounds and would reject it if it were to break

familial relationships. However, the Islamic prohibition of surrogate parenting, adoption and the adoption of human embryos would free up excess embryos for research purposes as, under Islamic law, they could not be used by anyone other than the couple who created them.

More generally, Islamic scholars emphasize the belief that all knowledge emanates from God and that, as such, human beings have an obligation to use that knowledge to serve society. In Islam, research on stem cells is therefore regarded as an act of faith in the ultimate will of God, as long as such an intervention is undertaken with the purpose of improving human health.

This stance of Islam is similar to that of Judaism. According to the Torah, Jews have an obligation to seek knowledge, and scientific knowledge is granted high value. "Our theological predisposition is not only to welcome, but to aggressively pursue new technologies that improve our lives and our world," said Rabbi Edward Reichman, Assistant Professor in the Department of Epidemiology and Population Health and its Division of Philosophy and History of Medicine at Yeshiva University's Albert Einstein College of Medicine (Bronx, NY, USA). "The preservation of human life, *pikuach nefesh*, is paramount in Jewish law, and all biblical and rabbinic prohibitions—except murder, illicit sexual relations and idolatry—are suspended to facilitate its preservation." The strong value placed on human life has the potential to encourage therapeutic stem-cell research and to see it almost as a mandate, rather than a permission. Most Jewish scholars are indeed distrustful of outright governmental bans—a joint statement between the Union of Orthodox

Jewish Congregations of America and the Rabbinical Council of America said, "if cloning technology research advances our ability to heal humans with greater success, it ought to be pursued since it does not require or encourage the destruction of life in the process."

The question is to what extent religion could, or should, influence science and vice versa

The possibility of cloning humans challenges deeply held beliefs about creation and mankind's relationship with God. If God is seen as the only Creator and creation as a completed act, then there would be no right for man to tamper with it. Others, however, regard God as the Power of Creation and creation as a transformative process, and therefore find a role for human participation. Some Jewish scholars advocate the latter view when considering reproductive cloning as a means to accomplish good. "The process or 'mechanical' aspects of human cloning present no major legal obstacles from a Jewish perspective," commented Reichman. "However, the low efficacy and potential adverse outcomes of human cloning are legal concerns that would lead us to reject any human cloning at this time. Prospectively creating people of legally ambiguous lineage, and who may suffer profound social and psychological complications may preclude any future acceptance of cloning despite perfection of the procedure from a medical perspective."

Given the different ethical arguments that revolve around the status of the embryo, the conception of life and the nature of creation, it seems impossible to reach a consensus between different religions with regard to therapeutic and reproductive cloning. What is clear is that religious beliefs exert a strong influence on these debates.

In fact, the relationship between science and religion has often been difficult. Science has repeatedly shaken religious beliefs, at least in the Western tradition. The Copernican and Darwinian revolutions challenged our views of God's agency and forced people to re-examine their understanding of the universe and humanity's place in it. Today, we are in the midst of another scientific revolution that

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might change society through the applications of biological research while challenging our beliefs about the value of human life. The question is to what extent religion could, or should, influence science and vice versa. It comes back to the old problem about where to draw the line between the two realms. As Albert Einstein said: "For science can only ascertain what is, but not what should be, and outside of its domain, value judgments of all kinds remain necessary. Religion, on the other hand, deals only with evaluations of human thought and action: it cannot justifiably speak of facts and relationships between facts" (Einstein A (1941) Conference on Science, Philosophy and Religion in Their Relation to the Democratic Way of Life, Inc., New York, USA).

This means that scientists have to take into account the resistance on the part of some religions to resolve this new conflict between science and religion. If it keeps festering, religious hostility might further impede the public acceptance of science and have negative effects on general science education. Nevertheless, some of society's strongest cultural and moral values are deeply embedded in religious contexts. If science and scientists show respect for the moral wisdom emerging from religious traditions, this might help to make use of scientific knowledge in a thoughtful and sensitive way. Conversely, religious leaders need to be open to the knowledge emerging from science so as to advise society about how to apply it in accordance with moral and ethical values. As Einstein put it: "science without religion is lame, religion without science is blind."

Giovanni Franzetto

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Like a snake in the grass

As the incidence of type 2 diabetes escalates, new developments offer hope for better treatments

An epidemic of obesity is reaching around the globe (Brower, 2002) and diabetes is sneaking up behind it. Type 2 diabetes, which accounts for 90–95% of all cases of the disease (type 1 is an autoimmune disease), is on a steep rise in both the developing and developed worlds. At its present rate of growth, the first quarter of the twenty-first century will see a doubling of the number of individuals suffering from diabetes to ~300 million worldwide. In the USA alone, diabetes is now the fifth leading cause of death, and cost around US\$132 billion in direct and indirect medical expenditures during 2002 (Hogan *et al*, 2003). There are 16 million diagnosed diabetics in the country, with almost the same number undiagnosed, and ~1 million new cases each year.

This not only has implications for those suffering from diabetes but also puts national healthcare systems under increasing stress. "The economic impact on the global healthcare economy will be overwhelming," said Gerald Bernstein, Associate Professor at Albert Einstein College of Medicine (Bronx, NY, USA) and former president of the American Diabetes Association. The main reason is that diabetes not only affects the pancreas but also slowly destroys the whole body, shortening lifespan by an average of 15 years. "Glucose is toxic to cells, and hyperglycaemia affects every organ of the body," said Bernstein. The increase in diabetes cases is caused by an ageing population, a sedentary Western lifestyle and rising obesity, which is fuelled by poor nutrition. Also, type 2 diabetes, which is