# The Dolly case, the Polly drug, and the morality of human cloning

## O caso Dolly, o fármaco Polly e a moralidade da clonagem humana

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**Abstract** *The year 1996 witnessed the cloning of the lamb Dolly, based on the revolutionary somatic cell nuclear transfer (SCNT) technique, developed by researchers from the Roslin Institute in Edinburgh, Scotland. This fact marked a relevant biotechnoscientific innovation, with probable significant consequences in the field of public health, since in principle it allows for expanding possibilities for the reproductive autonomy of infertile couples and carriers of diseases of mitochondrial origin. This article expounds on 1) the experiment's technical data and the theoretical implications for the biological sciences; 2) the public's perception thereof and the main international documents aimed at the legal and moral regulation of the technique; and 3) the moral arguments for and against cloning, from the point of view of consequentialist moral theory. We conclude that in the current stage of the debate on the morality of cloning, in which there are no cogent deontological arguments either for or against, weighing the probability of risks and benefits is the only reasonable way of dealing with the issue in societies that consider themselves democratic, pluralistic, and tolerant.*

**Key words** *Genetic Engineering; Cloning; Reproductive Medicine; Bioethics*

**Resumo** *Em 1996, a ovelha Dolly foi clonada, valendo-se da técnica revolucionária do* somatic cell nuclear-transfer *(SCNT), desenvolvida por pesquisadores escoceses do* Roslin Institute *de Edimburgo. Esse fato representa uma inovação biotecnocientífica relevante, com prováveis conseqüências significativas no campo da saúde pública, pois permitirá, em princípio, ampliar as possibilidades da autonomia reprodutiva de casais inférteis e portadores de doenças de origem mitocondrial. Neste artigo, abordam-se 1) os dados técnicos do experimento e as implicações teóricas para as ciências biológicas; 2) a percepção pública no que se refere à clonagem e os principais documentos internacionais que visam a sua regulamentação jurídica e moral; 3) os argumentos morais pró e contra a clonagem, do ponto de vista da teoria moral conseqüencialista. Conclui-se que, no estágio atual do debate sobre a moralidade da clonagem, no qual não existem argumentos deontológicos cogentes, nem a favor nem contra, a ponderação da probabilidade de riscos e benefícios constitui a única maneira razoável de enfrentar a questão em sociedades que se pretendem democráticas, pluralistas e tolerantes.*

**Palavras-chave** *Engenharia Genética; Clonagem; Saúde Reprodutiva; Bioética*

## Dolly, Polly, and others

On July 5, 1996, the lamb Dolly was born, a clone of the Finn Dorset breed, created from nuclear DNA from a differentiated adult cell extracted from the udder of a gravid ewe and introduced into the previously enucleated oocyte of another ewe of the Blackface breed, thanks to a technique known as nuclear substitution or somatic cell nuclear transfer (SCNT), developed by the team of embryologist Ian Wilmut at the Roslin Institute in Edinburgh, Scotland (Pennisi & Williams, 1997; Wilmut et al., 1997).

Considering that Dolly resulted from the union of two individual cells, of which at least one is a sexual cell (the oocyte of the receptor ewe), strictly speaking Dolly cannot be considered a true clone (or an individual born of another individual through asexual reproduction), but rather a *sui generis* clone or a 'later-born identical twin' of the ewe that provided the nuclear DNA.

However, both the mass media and the specialized literature presented Dolly as a clone, given that: a) Dolly was born without undergoing the process known as reproduction by fecundation, using male and female gametes; b) the researchers have 'reprogrammed' a differentiated (or specialized) adult cell, making it a stem cell. In this sense, Dolly involves the transformation of the very concept of cloning; hence we will consider her a 'clone' for the purposes of this discussion.

If Wilmut's experiment is confirmed, Dolly will open up new possibilities for human reproduction and procreative autonomy, inevitably implying a review of moral values consolidated through a new consideration of risks and benefits for human well-being.

Since the first data on the experiment were published, Dolly has been the focus of various types of speculation, including the moral controversy between those affirming the intrinsic immorality of human cloning (presumed to be contrary to human dignity and human rights, and thus subject to prohibition under any circumstances) and those who favor its regulation after weighing the potential risks to reproductive health and the benefits for procreative autonomy.

In fact, Dolly is not the first animal clone *in natura*, nor the first produced by man, or even the 'closest' clone to the original. There are clones that are genotypically much closer, much more common in the plant kingdom, but not uncommon in the animal kingdom, including mammals, even in the human species. Such is the case of monozygotic twins (also known as 'identical twins'), born of a single oocyte fecundated by a single sperm cell, born in the same uterine environment and which thus share not only the same nuclear DNA (like Dolly) but also the same mitochondrial DNA (although the role of the latter in vertebrate development remains obscure) (Kitcher, 1997:59). Dolly is also not the first man-made animal clone, since clones have already been produced with amphibians, fish, and mammals since 1952 (Di Bernardino & McKinnell, 1997; Gurdon, 1997). But these cases involved the use of the cell mass division technique, also known as embryo splitting or blastomere separation, consisting of manipulating embryos in the first stages of life. Embryo splitting was also used in an experiment for cloning human embryos in 1993 at George Washington University, by Jerry Hall and colleagues, with the purpose of helping infertile couples (the experiment was interrupted by US government officials). The Roslin researchers had already reported the birth (in March 1996) of Megan and Morag, using the same SCNT technique, but applied to adult embryonic cells (Campbell et al., 1996).

Less than a year after the creation of Dolly, Wilmut and his team created the transgenic lamb Polly, combining animal and human genetic material and utilizing the embryo splitting technique. There are substantial differences between the two experiments: a) Dolly has the same nuclear DNA as her older sister, while Polly contains part of the DNA from the donor ewe and part from human DNA; b) Dolly was 'cloned' from specialized adult cells, while Polly was created from embryonic stem cells. However, one could also conceive of a continuum between the two experiments, since Polly is aimed at producing a line capable of supplying milk containing -1-antitrypsin, a human plasma protein used in the treatment of cystic fibrosis, thereby opening the way for the large-scale, low-cost production of other human proteins. In short, one can reasonably suppose that the experiments at the Roslin Institute will serve to facilitate and universalize the prevention and cure of various human diseases; transgenic cloning could also allow for creating a sufficient supply of organs for transplantation in human beings, with lower rejection rates.

This interpretation appears to bear out if we think about the different public reactions to the two cases. Dolly caused a huge public commotion, immediately becoming a 'case', while Polly went virtually unnoticed and became a banal fact. This difference in public perspective appears paradoxical if we consider that Polly contains human genetic material, but this can

probably be explained by the fact that the mass media focused mainly on the threatening side of cloning with Dolly, while for Polly the therapeutic potential prevailed, and I believe properly so (Schramm, 1997a).

The first doubts and criticism from the scientific community only came in January 1998, published in *Science* (Sgaramella & Zinder, 1998). The critics based their attack on the observation that there were not 'more Dollies' capable of confirming the 'single observation' by Wilmut, and that clones of other mammal species, promised for 'very soon', had still not appeared (at least publicly). Therefore, went the argument, there were serious reasons to doubt whether Dolly had actually been created in the terms reported by Wilmut or thus that she represented a relevant and innovative scientific fact. Besides, Wilmut and his team were believed to have committed a series of methodological errors: 1) the fact that they had not performed the genetic confirmation with the 'fingerprint' technique, relatively easy and which would have allowed to determine whether Dolly was a later-born twin from the donor ewe; 2) the fact that they had not utilized an adult mammary cell, but rather a fetal cell supposedly present in their cell culture, which could be explained by the fact that the donor ewe was gravid at the time the cells were harvested.

In their rebuttal, Campbell, Colman and Wilmut (Campbell et al., 1998: 636-637) recognized that "*a single birth from 400 attempted fusions is not an efficient system*", but they only admit a remote possibility of error, because at the time of the experiment there was only one Finn Dorset cell culture in the laboratory; thus, they contend, "*Dolly can only have been derived from the cell culture established from the mammary gland*". Besides, given that this cell culture was not planned for the nuclear transfer experiment, but for other purposes, there was a valid reason for not having analyzed the genotype of the cells used for insemination and for not having kept the fetal material for subsequent 'fingerprint' analysis. As for the absence of further Dollies, the authors also recalled that only eleven months had transpired since publishing the first data, which was too short a time considering that five months are required for this type of gestation, plus the time for writing up and publishing the results.

In order to clarify some terms in the debate, we will take an introductory approach to the following aspects: I) the biotechnoscientific relevance of the Dolly 'fact'; II) the public perception of the Dolly 'case'; III) the morality of cloning in the context of the secularized and pluralist societies of modern democracies.

## The biotechnoscientific relevance of the Dolly 'fact'

From the biotechnoscientific point of view, and despite the fact that many questions remain unanswered, we suggest what the relevant aspects are, assuming that the results of the Roslin Institute experiment will be confirmed. We will distinguish between the experiment's practical (or technical) significance and its theoretical relevance and then analyze its implications for biosafety.

### Practical Significance

If confirmed, SCNT allows to expand procreative techniques in mammals and improve human reproductive health, without going through the standard fertilization procedures. For the time being, the proportion of viable embryos obtained from SCNT is very low (less than 1%), while "*the factors determining the success or failure of the technique, and the long-term development of animals generated in this way, still need to be established*" (Kahn, 1997:119). However, it is assumed that SCNT will improve human reproductive health by controlling the transmission of genetic traits in women with serious diseases of mitochondrial origin (Walters, 1997 apud Parens, 1997).

In short, Wilmut's experiment included the following stages:

1) depriving a differentiated adult cell culture of its nutrients, reducing it to a state of quiescence (or dormancy), and depriving it of the nucleus containing DNA;

2) enucleating the oocyte from the receptor ewe to receive the nucleus of the donor cell;

3) fusing, using an electric charge (acting as a spark), the nucleus of the donor cell with the enucleated receptor cell; and

4) implanting the resulting embryo in the uterus of a third pregnant ewe, which went on to give birth to Dolly.

Wilmut and his team faced a huge challenge, given that before their experiment scientists thought it was impossible to clone mammals from differentiated adult cells; they believed it was necessary to intervene in the embryo stem cells, manipulating their nuclear DNA and running a serious risk of damaging their structure. Technically, they thought it was necessary to discover the correct phase in which donor-cell DNA could be 'grafted' into a receptor cell without the DNA killing the cell or generating 'chimeras' (resulting from the fusion of two embryos).

After many unsuccessful attempts (exactly 277, according to the author), rather than in-

sisting on attempting to combine the numerous DNA sequences at the right moment (an extremely complex and risky operation), Wilmut had an original idea: he treated the nucleus of the donor cell like a 'black box' and introduced it into the receptor oocyte. It worked, despite the fact that we still do not know the exact conditions under which the experiment was performed, which will only become known when there are other experiments of the same type (and probably after the patenting of SCNT).

## Theoretical significance

From the theoretical point of view, the cloning of Dolly can be considered an important step, indeed a veritable revolution in the field of biotechnosciences, creating new research perspectives in both molecular biology and the theory of evolution (Kahn, 1997), providing new conceptual 'tools' for the following two-pronged issue:

a) the degree of 'functional plasticity' of a cell's genome, prone to reprogram and invert its evolution and making it revert from the differentiated stage to the stem cell stage;

b) the genome's degree of 'structural stability', capable of ensuring the cell's and the organism's identity during the evolutionary process.

The two issues constitute the two sides of one and the same problem, that is, "*Do growth, differentiation and development of the embryo involve irreversible modifications to the genome in somatic cells?*" (Stewart, 1997:769).

Upon cloning Dolly from differentiated cells from an adult female individual, Wilmut and colleagues appear to have produced arguments in favor of the thesis by which the genome of at least some types of cells (like mammary cells) do not undergo irreversible modifications during the evolutionary process, while the differentiated cell under given conditions (to be determined) can revert to its initial stage of undifferentiation, thus functioning as a stem cell. This is theoretically relevant since we knew that the genome of other cells, like that of lymphocytes, for example, definitely undergoes recombination in given regions.

Before Dolly was created using SCNT, cloning experiments using separation of cells from the blastomere (the embryonic stage with only 4 or 8 cells) appear to indicate that the DNA from such cells was not altered, while it was supposed that the nuclear genetic code was. On the contrary, the Dolly experiment appears to have raised arguments in favor of the thesis according to which adult cells can maintain their DNA unchanged, thereby remaining competent to conserve their functional identity. Beginning with Dolly, one can contend that at least some types of adult cells (duly manipulated) are functionally totipotent (Pennisi & Williams, 1997). In short, Dolly appears to prove that there was a reprogramming (although we do not know exactly why) of the donor somatic cell, making it totipotent (Kahn, 1997). Thus, if confirmed, the Roslin Institute experiment represents a significant biotechnoscientific step towards new forms of conserving and reproducing genetic information.

## Biosafety aspects

Yet Dolly involves a third important aspect, regarding biosafety and legal implications, since she was the product of genetic manipulation and hence we can reasonably ask if she is not a genetically modified organism (GMO). Indeed, if Dolly were a GMO, she would be the object of specific regulation, considering that in many countries experiments with GMOs are subject to rigorous restrictions. Such is the case with the *Brazilian Biosafety Act* no. 8974 of January 5, 1995, the first article of which establishes "*safety norms and inspection mechanisms for the use of genetic engineering techniques in constructing, culturing, manipulating, transporting, marketing, consuming, and disposing of genetically modified organisms (GMOs), aimed at protecting the life and health of humankind, animals, and plants, as well as the environment*" (Brasil, 1995:5), further providing sanctions for offenders.

If we view genetic engineering in its narrower sense of 'recombinant DNA technology', the Dolly 'clone' cannot be considered a clear-cut product of genetic engineering, nor an orthodox GMO, since strictly speaking there was no alteration in the sense of a 'recombination' of different DNAs (as in the case of Polly). What happened was a manipulation in the sense of a transfer of a 'closed package' of DNA from a donor cell to a receptor cell, but without fusion or recombination of different DNAs. However, if we applied the same technique to humans, we would run up against article 8 of the above-mentioned law, which prohibits genetic manipulation of human germ cells *in toto*.

One could thus argue on the one hand that the SCNT used to make Dolly does not involve 'genetic manipulation of germ cells', but that we can consider it a kind of manipulation, as the experts did from the Brazilian National Commission on Biosafety (CTNBio), based on a distinction between *ontogenesis* and *function*.

Based on this interpretation, the CTNBio stated the following: "*a somatic cell nucleus introduced whole into an enucleated oocyte, although giving rise to an embryo, cannot, from an ontogenetic point of view, be considered a germ cell;* [however] *since the oocyte was enucleated, and since the nucleus of another cell was introduced into it to make the experiment possible, this process constitutes (...) germ cell genetic manipulation*" (CTNBio, 1997).

In other words, from the ontogenetic point of view, the whole formed by the nucleus of the differentiated donor cell and the enucleated receptor oocyte perhaps cannot be considered a GMO, but from the functional point of view it can, since there was genetic manipulation of the germ cell, which in principle allows one to consider Dolly a GMO. This 'hairsplitting' in the definition, although logically and semantically odd, has its reasons. In fact, the legislator's concern in this article aimed to avoid by all means possible that manipulation of and interference in human genetic material become hereditary, passing the 'manipulated' characteristics on to the offspring. That is, it is important to know whether Dolly is a GMO because one of the main concerns of biosafety is the possible health impact (i.e, the 'hazardousness') resulting from the introduction of GMOs into the environment, given it would reduce biodiversity and therefore the ability to resist pathogenic microorganisms. However, considering that SCNT is an incipient technology, it will be necessary to 'let the dust settle' and wait for other scientists to repeat the experiment under the proper conditions and as often as deemed necessary in order to evaluate the probability of risks and benefits.

What might be the spin-offs of cloning for humans?

In principle, from the purely technical point of view, cloning applied to humans is merely a matter of time and investments in order to:

1) repeat Wilmut's experiment as often as necessary to confirm its feasibility for humans, which is expected in one to ten years (Nature, 1997) and

2) lower costs and optimize the risk/benefit relationship to make it feasible for health policies.

However, it appears unlikely that 'cloning' in humans will become commonplace. It is more likely that humans will continue to reproduce using the traditional method, which appears to be much more pleasurable. In other words, cloning should be viewed as an exceptional method, to be used when others fail. It appears improbable that in the foreseeable future cloning will significantly affect the genetic structure of the human population, reducing its biodiversity.

At this stage one might ask if Dolly is not a predictable 'artifact', especially in light of a serious of traits in contemporary Western societies, such as: the simultaneously rational and operational structure of contemporary science, making it a *technoscience* (Hottois, 1990); its evolution towards the 'reprogramming' of living systems, making technoscience a *biotechnoscience* (Schramm, 1996); the emergence of a consumer society marked by a 'health culture of desires' (Pellegrino, 1979), which in some cases means a veritable obsession with 'perfect health' (Sfez, 1995). One could thus state that biotechnoscientific techniques like the cloning of Dolly are part of the very logic of the collective imagination and of the means to satisfy the needs and desires of consumers.

All this helps explain why Dolly, besides constituting a noteworthy biotechnoscientific fact, rapidly became a symbol for a possible and even probable transformation of the human condition, despite Wilmut himself stating clearly that it would be out of the question to clone human beings, since "*it would be unethical to attempt the experiment with people*" (Wilmut, 1997:4).

Yet it is through the possibility of affecting this image that humans have of themselves and the potential for transforming so-called 'human nature' (or the human 'essence') that the social controversy arises over the legality of this new threshold achieved by biotechnoscientific know-how.

## Public perception: the 'Dolly case'

After *The Observer* and *The New York Times* announced the birth of Dolly in their February 23 and 24, 1997, issues, the news rapidly became the 'Dolly case'. Sci-fi stories about cloning soon appeared, along with analogies like those published by *Newsweek*, comparing the likely consequences of cloning with those of the nuclear bomb or chemical weapons (Begley, 1997). Other analogies, like those in *Time*, compared Dolly to Frankenstein, with armies of drones, cloning factories producing spare parts, and dictators producing generations of clones of themselves (Kluger, 1997).

In Brazil, the mass media announced the cloning of human beings, highlighting the possible violation of fundamental rights, which fed fears of authoritarian eugenist policies and helped muddle the debate. The weekly *Veja*, for

example, ran a story with the title *The Dolly revolution. It's now possible to clone a human being* (Veja, 1997) and the weekly *Istoé* made matters worse by talking about a 'people factory' and 'duplicating human beings' (Istoé, 1997). On the other hand, the scientific awareness magazine *Ciência Hoje* published a balanced report of the facts and their biomedical and moral implications (Pena, 1997; Rumjanek, 1997; SBPC, 1997; Schramm, 1997b).

Yet the reaction to cloning in the moral field was also essentially emotional and in many cases irrational, fluctuating between pragmatic approval (resulting from the hope of having found a new panacea for disease and organic dysfunction) and condemnation *a priori*.

In the United Kingdom, for example, the consequentialist approach prevailed, while in the United States the focus was more deontological and religious. This type of reaction in the American imagination appears to contradict that country's pragmatist tradition, but it makes sense when one recalls that "*the ethical discussion of cloning, however, seems to have taken us back in time. And the customary public and media excitement over the latest advances in medical technology was eclipsed by talk of moral repugnance, evil, wrongness, playing God, and impermissible interventions*" (Klotzko, 1997:430). In other words, the American debate involved a sort of Cultural War, in which "*the argument about Dolly saw two camps instantly formed – one was alarmed by the development and opposed to any further movement toward cloning humans; the other (seemingly much smaller) touted a potential gain in health and more reproductive choice if cloning went forward*" (Callahan, 1997a:24). In other countries, like France, there was no less emotional analysis of the pros and cons for cloning, weighing, for example, the probability of risks and benefits, and the debate was left with petitions of principle, falling back on the sophism that condemns cloning *a priori* because it is supposedly unacceptable, with no more elaborate arguments (Taguieff, 1997). In short, and in general, the debate was left in a stage of polarization between the following:

1) 'fascination', resulting from both the new potential created by cloning for health and well-being and the 'confrontation with immortality' that has accompanied human imagination since time immemorial (Mattei, 1997);

2) 'alarm', probably resulting from humans' fear of losing their identity and specificity, given that "*the aesthetic and ethical foundation of modern Western culture rests firmly on our belief in the distinctiveness of each individual*" (Gould, 1997:14).

This is why the 'Dolly fact' became the 'Dolly case', immediately mobilizing not only scientists, philosophers, theologians, jurists, and politicians, but also the imagination of the public itself.

## The positions of the NBAC, the Vatican, WHO, UNESCO, and GAEIB

Particularly relevant official positions include those of the President of the United States and the National Bioethics Advisory Commission (NBAC), the Vatican, WHO, UNESCO, and the European Community's Group of Advisers on the Ethical Implications of Biotechnology (GAEIB), reacting tempestuously to the Dolly announcement.

The President of the United States immediately commissioned a report from the NBAC, having 90 days to advise on the risks, benefits, and ethical and legal implications of potential human cloning (The White House, 1997). He also imposed a moratorium on human cloning in public institutions, cutting off funds for both research and clinical applications, and requesting that private institutions voluntarily adopt the same attitude (The White House, 1997).

Clinton's position may have been hasty, considering the possible benefits of cloning and the many doubts still surrounding it, relating for example to the role of mitochondrial DNA in defining individual identity and the interaction with nuclear DNA; interactions with genetic mutations and the function of telomere length (which allows one to measure the respective age of the donor, receptor, and Dolly herself). As stated by NBAC chairman Harold T. Shapiro himself, "*several serious scientific uncertainties remain that could have a significant impact on the potential ability of this new technique to create human beings*" (Shapiro, 1997: 195).

Prudence prevailed in the report by the NBAC, which published its conclusions in June 1997 after a broad consultation with experts from various fields (NBAC, 1997). Yet there was no lack of criticism for the report's 'ambivalence' (Bilger, 1997:17), since the prohibition only impacted public institutions that depended on federal funds, and not those using private capital. The NBAC thus took the middle of the road by stating that "*whether the use of this new cloning technique to create children should be allowed or permanently banned is, for the moment, an open question*" (Shapiro, 1997:196). In his introduction, Shapiro justifies this stance

by underscoring both the scientific uncertainties and the difficulties, on the one hand, in deciding "*if and when our liberties, including the freedom of scientific inquiry, should be restricted*" and on the other, in weighing the risks and benefits of human cloning, including the issue of individual identity, personal autonomy, family ties, and intergenerational relations (Shapiro, 1997:195).

This stance by the NBAC is understandable considering that it had to ponder the plurality of opinions for and against cloning in the different interest-based and moral communities in the United States. It thus proposed legislation capable of allowing cloning of embryos for research purposes in some cases and maintaining the prohibition in principle over human cloning with regard to the use of embryos for procreative purposes. In other words, NBAC experts suggested that scientists relying on private funding be allowed to clone human embryos for research purposes, but that the use of such embryos for procreation be prohibited.

In addition, the NBAC proposed a sunset clause according to which the Congress should review its position after a trial period of three to five years, based on progress in research and risk prevention. In the opinion of Callahan, "*the idea of a sunset clause was the perfect via media, of a kind that commissions traditionally seek when opinion is radically divided. In that respect, it was a good political solution, attempting to balance a variety of values and interests*" (Callahan, 1997b:18). According to NBAC member Alexander M. Capron, prudence was justified because the issue of human cloning has to do with one of most morally conflicting fields in bioethics: that of human reproduction, such that cloning is "*genuinely controversial*" given that "*the winds that roil these waters blow from the poles, with scientific and reproductive freedom at one pole, and sanctity of life and traditional family values at the other*" (Capron, 1997:173). Besides, by suggesting a *temporary* moratorium on human cloning, the NBAC also aimed to make a distinction between cloning for human reproduction, or 'making babies', from cloning as research, that is, human cloning per se (the real object of the Commission's moratorium), and cloning of other animals and plants. Both this distinction and the legal stratagem of the sunset clause thus appear to suggest that the NBAC does not intend to prohibit cloning *in totum*, since "*just as it is a mistake to imply, as sometimes happens in ethics discussions, that everything we have a right to do is right to do, so too it would be a mistake to say that everything we believe would be wrong to do should be wrong to do*" (Capron, 1997:176).

However, according to other researchers, this 'compromise' is a *de facto* prohibition, with serious consequences in the legal and political field, given that it turns cloning into a veritable 'political football in Congress' and ends up chilling an important field of research in public institutions, delaying the development of safe procedures (Wolf, 1997).

Neither was there consensus over religious aspects, which are also discussed by the NBAC, since some theologians considered human cloning intrinsically immoral, while others found it morally justified in some circumstances, so long as clearly regulated to prevent abuses (Shapiro, 1997).

Meanwhile, the Vatican, through its official bulletin *L'Osservatore Romano* of February 26, 1997, condemned cloning, stating that "*in both scientific research and experiments there are limits that should not be transgressed from either the ethical point of view or that of nature*" (Correio Braziliense, 1997:10) and requesting its interdiction by the various heads of government. In addition to this deontological principle, according to which it is always morally illicit to interfere with the wishes of the Creator and the intrinsic finalism of natural processes, the Vatican drew on the consequentialist argument known as the 'slippery slope argument', according to which we should refrain from doing something due to the possible abuses it entails.

The WHO took another approach. Director General Hiroshi Nakajima condemned the use of human cloning as "*ethically unacceptable as it would violate some of those basic principles which govern medically assisted procreation. These include respect for the dignity of the human being and protection of the security of human genetic material*" (WHO, 1997a, apud Harris, 1997:354). Later, in its 50th General Assembly, the WHO published a resolution stating that "*the use of cloning for the replication of human individuals is ethically unacceptable and contrary to human integrity and morality*" (WHO, 1997b, apud Harris, 1997:354).

Unesco, in turn, concerned over preserving different types of human endowments, declared that human cloning should be banned under any circumstances, given that "*the human genome must be preserved as the common heritage of humanity*" (Unesco, 1997, apud Harris, 1997:354).

Finally, the GAEIB published its comments on the consequences of cloning on May 28, 1997, stressing the danger of instrumentalizing

human beings, the risks of eugenist policies, and the reduction of genetic diversity, whence "*any attempt to produce a genetically identical human individual by nuclear substitution from a human adult or child cell ('reproductive cloning') should be prohibited*" (GAEIB, 1997: 352).

However, all these stances, although probably 'politically correct' (like that of the United States), do not hold water when submitted to a closer analysis. As stated by Daniel Callahan in referring to the NBAC report, "*the present debate on cloning should by now have made perfectly clear an enormous shortcoming in bioethics*", given that "*as a field* (...) *it simply has few helpful tactics, insight, or even good provisional strategies, to respond to novel biological developments* (...) *But its political strengths betray its ethical weakness*", hence "*the report is stronger procedurally than substantively*"(Callahan, 1997b:18).

Harris, in turn, in analyzing the arguments from the other documents, shows how they remained within the sphere of petitions of principle against cloning, the result of 'instant reactions' and with inconsistently drafted arguments, concluding that "*the objections to human cloning [are] less than plausible*" (Harris, 1997:358). Accepting the argument of the existence (in current liberal democratic societies) of the right to 'procreative autonomy', that is, the "*right to control their own role in procreation unless the state has a compelling reason for denying them that control*" (Dworkin, 1993 apud Harris, 1997:358), Harris contends that if we wish to live in such a society, "*we should be prepared to accept both some degree of offense and some social disadvantages as a price we should be willing to pay in order to protect freedom of choice in matter of procreation and perhaps this applies to cloning as much as to more straightforward or usual procreative preferences*" (Harris, 1997:359).

Therefore, we should avoid both the feeling of alarm which demonizes the 'Dolly fact' and predicts a somber, not-too-distant future, peopled with legions of enslaved human clones, programmed and organized in a kind of society of 'drones', void of individual will and the feeling of *fascination*, which enshrines the fact and contends that the precariousness and finitude of the human condition are on the verge of being overcome forever thanks to a new bio-anthropo-social order, consisting of individuals belonging to a species better adapted to a world in rapid transformation with healthier physical and psychological characteristics and more desirable skills, to the point of being 'perfectly healthy' (Sfez, 1995). The two positions (which we have caricatured here for didactic purposes) can be equally harmful, since they stir up uncontrollable emotions and get what now is and what can actually come to be (the cloning of biological characteristics) mixed up with what is not nor can come to be (the cloning of individuality or personality).

## The morality of human cloning

Before directly approaching the morality of human cloning, we need to make a few preliminary remarks in order to demarcate the object of our analysis.

First, controlled cloning of plants and animals does not entail major moral conflict, as long as it is considered necessary for human well-being and as long as useless suffering of animals is avoided (GAEIB, 1997). Obviously there are pertinent objections to this position (like the 'biocentric' objections of given environmentalist sectors and the 'senticentric' objections of defenders of animal 'rights' or 'interests'), but strictly speaking these do not pertain to the field of bioethics, rather in fact to the fields of environmental ethics and animal ethics, which can be considered disciplines distinct from bioethics (Mori, 1994).

Second, the debate over cloning is not new, since it began in the 1960s, when human cloning was proposed for the first time as "*a scientific solution to preserving the endangered species of humanity*" (Campbell, 1997:15).

Third, there is a semantic complicating factor, given that we are not always sufficiently clear about what is meant by the term 'cloning'. In fact, we can mean different things by 'cloning':

1) cloning per se, or the production of individuals identical with an original through asexual reproduction, which is common in the plant kingdom and which in principle produces individuals with the same genetic endowment, but not necessarily, since some genetic mutation can occur during the process;

2) 'cloning' by SCNT, producing a later-born identical twin with the same nuclear DNA as the donor individual but without the same mitochondrial DNA; and

3) 'cloning' by embryo splitting, producing genetically identical monozygotic twins, but resulting from the recombination of the genetic endowment of male and female gametes.

Case 1) will not be approached here because cloning per se does not refer to human cloning (at least for the time being). The dis-

tinction between 2) and 3), on the contrary, is important for the inference of an individual's identity based on existing data and is pertinent to moral analysis. In fact, in 'cloning' by SCNT we have a 'clone' whose identity can be inferred *a priori* (that is, 'vertically') based on the genotypical identity of the clonable individual, known previously, while in 'cloning' by embryo splitting we have an individual whose genetic identity cannot be inferred ('vertically') based on information available *a priori*, but only determined 'horizontally', i.e., analyzing the genotype of another genotypical twin.

If we now consider the argument contrary to cloning, based on the right to an unmanipulated genetic endowment (i.e., *non-reprogrammed a priori*), as a necessary condition for respect for individual autonomy, we note that the moral controversy can only pertain to 'clones' obtained by SCNT, since nobody would reasonably think of morally condemning the situation of monozygotic twins. In other words, the moral controversy in this case can only pertain to cloned individuals implying *indistinction* between cloning individuals and cloned individuals.

## Identity and ipseity in cloning

The above remarks lead us to logically distinguish between the two senses of the word *identity*: 1) identity as 'identity' (from the Latin *idem*, 'same', 'identical') or 'sameness', understood as a property of one being belonging to a same class of beings possessing the same characteristics (for example, the class of individuals from the species *Homo sapiens sapiens*); 2) identity as 'ipseity' (from the Latin *ipse*, 'self') or 'selfhood', understood as the property that only one given being possesses in his/her/its unicity (for example, 'So-and-so'). In other words, if we apply this logical distinction to human beings, we can use the term 'sameness' to indicate the point of view that considers any human being as belonging to the species *Homo sapiens sapiens* because he/she possesses all those (and only those) characteristics that define the class of beings in question. Meanwhile, the term 'selfhood' refers to the point of view considering the human individual not as a member of the class of human beings, but as a particular individual (or, as it were, as a member of the class that only contains that member) and who thus possesses reflexiveness, in the double sense of 'knowing how to reflect' and being able 'to refer to one's self'. In other words, in the latter case we have a 'unique' being, that is, a person, who is "*a thinking and intelligent being, capable of reasoning and reflecting, who can consider himself the same,* (...) *who thinks in different times and places*" (Leibniz, 1980:176), or "*who is aware of the numerical identity of himself in different times*" (Kant, 1989:341), or still, "*not implying any assertion concerning a supposed non-mutant nucleus* [and] *implying a form of permanence in time that is not reducible to the determination of a substrate*" (Ricoeur, 1991:13; 143). In short, ipseity refers to the distinctive characteristics of the individual as such, the fact that the individual is him/herself, distinct from all others (Lalande, 1972:257) and in the case of humans, awareness of this 'selfhood'.

This logical distinction is indispensable for a proper moral analysis of human cloning. Indeed, an individual cloned by SCNT in principle has the same genotype (i.e, the same nuclear DNA) as the cloning individual, and the two can (presumably) be identical from the biological point of view. However, they will never have the same ipseity, given that they are distinct individuals with different experiences; hence, even at best, cloning can only produce generically identical individuals, reproducing their biological identity but never their personal identity.

But let us suppose, no matter how absurd it sounds, that it would be possible to make biological identity and personal identity coincide. In this case, we should postulate a highly improbable synergism of numerous identical and shared conditions, resulting from the same type of experiences, the same type of environment, and thus the fact of spatially and temporally coinciding with one's other self. In the case of real objects, this coincidence is physically and logically impossible, since "*we never find nor could we ever conceive that it would be possible for two things of the same kind to exist at the same time in the same place*" (Leibniz, 1980:172). In other words, in order for two individuals to have the same ipseity we should conceive of a paradoxical situation which would make myself coincide with my other self, which is logically impossible and practically unachievable, given that the clone should occupy the same space at the same moment (which is physically impossible), while its identity should coincide with its ipseity, confusing itself with its other self, which is contrary to the premise distinguishing between 'identity' and 'ipseity'.

Summing up, identity and ipseity cannot be confused, and human clones can in principle be identical from the point of view of all the physical characteristics, genetically determined, while they distinguish themselves from

each other by the fact that they do not occupy the same space/time; the fact that they do not have exactly the same life experiences and can make a distinction between one's self and the other. In other words, if we confuse biological and personal identity, we commit both a 'logical abuse' (confusion between identity and ipseity) and a 'biological reductionism'. However, reductionism is not uncommon, since there are frequent affirmations relating to the genetic origin of both organic characteristics and dysfunctions as well as character traits, attitudes, qualities, and personal preferences. In fact, the clone of a 'scientist father' can very well be an 'autistic son' (Dimenstein, 1997). In short, an individual's personal identity depends on biological characteristics, important for the image individual has of him/herself and for others; still, the cultural and social milieu, as well as experience, make this individual reshape the biological patterns that contribute to the formation of his/her personality.

## Are there arguments in favor of human cloning?

To begin, one should state that "*the ethical implications of cloning balance on a fine line*" (Kitcher, 1997:58), given that the technologies are still full of uncertainties regarding risks and benefits (as the NBAC report emphasized nicely).

Next, the current debate on the morality of cloning (as well as other problems in bioethics) should be seen as a difference between points of view as to what is considered good and evil, that is, as a "*difference between moral principles*" (Stich, 1989:229). Thus, different principles imply different moral theories providing us with different pertinent arguments for the analysis.

The arguments for and against cloning are generally of two types: deontological and consequentialist, each with its own logic. The former essentially says that something is good or bad *in itself* (because it is morally repugnant, against religious dictates, etc.); the latter contend that something is good or bad depending on its consequences. This paper does not focus on deontological arguments, rather only consequentialist ones, since we believe that in a secularized world with a plurality of legitimate moral (and oftentimes incommensurable) concepts, only consequentialist arguments (if properly argued) can be the object of a rational consensus and thus of a contract. This is valid *a fortiori* when one analyzes the morality of cloning in light of the potentialities for the field of health and especially for reproductive health and procreative autonomy.

Among the consequentialist arguments against cloning, a prime example is the 'slippery slope argument', according to which something should not be done because of its possible abuses. But this argument is not pertinent, since abuses are always possible, even with natural substances and products and techniques created with the best of intentions. In fact the slippery slope argument does not hold water anthropologically; we would not have emerged from the pre-hominid stage, since we would have virtually nothing of what has provided us with a better quality of life.

Finally, we need to know not only what is meant by 'human cloning', but also what its objectives are: (1) to clone a genetically compatible individual in order to save another? For example, to clone a brother to donate bone marrow, a kidney, or a liver? (2) to clone embryos to expand a woman's procreative autonomy, allowing her to have healthy children, without diseases of mitochondrial origin, for example? (3) to clone individuals with given characteristics, like greater physical fitness for sports contests, or greater resistance to environmental adversities and diseases? (4) to clone individuals in the name of the collective interest or the welfare of a community or society?

Such examples raise different degrees of morality. The first (1 and 2) do not appear to raise substantive moral objections, at least from a utilitarian-consequentialist point of view; number (3) is controversial, but perhaps tenable in some cases; and (4) is clearly unacceptable in a liberal democracy, where in principle there is respect for individual rights.

Indeed, in example (1), the cloning of a new, genetically compatible individual makes it possible to save the sibling's life, with no harm to the clone (in the case of bone barrow or a segment of liver, both of which regenerate), or with limited harm in the case of a kidney. In both cases the pertinent moral argument is that the benefit is greater than the damage. Still, one could reasonably object that the loss of a kidney is significant, even when it benefits a sibling: after all, no one should give up a part of his/her body to benefit another individual and only does so out of pure benevolence, which would certainly be welcome, but not mandatory. In addition, to raise one child with predetermined characteristics in order to benefit another runs against the principle of respect for individual autonomy and the right to defend one's interests insofar as they do not jeopardize those of others, given that the

clone's right to chose what he/she wants out of life would not be ensured. In this case, the arguments in favor of cloning will bring other factors into play, like affection, altruism, and other 'virtues', which may be desirable but which can never be imposed reasonably. However, it is important to note that this type of sacrifice may soon become obsolete thanks to the subsequent development of cloning technology itself, producing organs rather than individuals, which will eliminate the moral objection.

What is at stake in example (2) is the enhancement of the woman's reproductive health, and more precisely, her procreative autonomy, since a woman who wishes to have a healthy child will be able to choose the most adequate procreative method for her specific situation. Morally, this case does not appear to be different from assisted fertilization, a commonplace practice in many countries today, given that the right to one's own health and that of one's children is a right recognized by contemporary democratic culture, including the WHO.

Example (3) seems more controversial. To understand this controversial side, let us take an example. Suppose that during the evolution of the species *Homo sapiens sapiens*, an individual emerges with given genetic characteristics, proven to be responsible for a reduction in the "*probability of threats*" (Luhmann, 1996:73), i.e., a greater resistance (or lesser susceptibility) to given dysfunctions or diseases, like mortal viruses; or to adverse environmental conditions, like pollution, radioactivity, ionization, etc. In part, this already occurs naturally in the process of natural selection thanks to genetic variability. But in this specific case, one could reasonably ask if it would not be morally licit to preserve this characteristic rather than let things run their 'natural' course through the lottery of natural selection, which would only favor carriers of the protective characteristic. The pertinence of this question emerges if we consider that nature itself does not always do what is best for man, i.e., that "*before the appearance of man, evolution (including the evolution of life) had been a highly threatening process in itself*" (Luhmann, 1996:73), which could explain the emergence of technique and culture as indispensable factors for human survival. In this sense, the respective characteristic can be considered (in principle) a *good*, both for the carrier of the resistant trait and for other individuals who might come to benefit from it. And if it is a good, its preservation through cloning can be justified reasonably, thereby making this good available to others and reducing illness and increasing well-being for more humans.

Suppose further that this ability to resist mortal viruses and other adverse situations is not the result of nature's lottery or natural selection themselves, but the result of human interference, and that this resistance could literally come to be 'built' on the basis of transgenic modification. This second case is no different (*mutatis mutandi*) from the first, and the type of moral analysis is practically the same, since both involve knowing whether or not it is morally licit to intervene in normal, natural processes that are 'predicted' or which 'happen' during evolution.

The issue is obviously controversial and complex. First, because due to the probable evolution of cloning technology itself, it will probably not be necessary to clone individuals, but only organs and tissues, which can very well be grown in laboratories and administered through equitable health policies. One will also be able to use genetic therapy, intervening in somatic cells (to cure damage) in an individual, and if the absence of significant risks is proven, acting on germ cells (to prevent damage) that will transmit the 'resistance' to future generations. Regarding this point, one could ask if this type of intervention is not a form of eugenics, aimed at improving the 'human race'. It is, but so is any attempt to improve the human 'species'(in fact, individuals), employing other means, like education (in all its variants), eating, life styles, etc., to which nobody raises reasonable objections, except for the individual right to choose one's way of life, which as we know is conditioned in thousands of ways. Another apparently relevant argument refers to the risk that cloning might decrease biodiversity and thus increase vulnerability, given that it could in principle make all human individuals genetically identical and thus threaten humankind with extinction if a new organism appears against which it is not protected. All these objections are pertinent, since they refer to potential risks, but they are based on the premise that cloning, rather than serving as a therapeutic or preventive medium to be used in cases of actual need or legitimate wishes, will become a fad, or even worse, a means to do harm, and that cloning would reduce biodiversity, which remains to be demonstrated and about which there are serious doubts.

In short, we are still quite ignorant as to the effects that human clones might have on the sociocultural life of an entire population, not to mention the identity-related psychological problems clones might experience due to the

great social expectations surrounding them, which could very well mean a restriction of their freedom and thus contradict the very purpose of greater individual autonomy. But the crucial point in this case is the principle of responsibility exercised by individuals who should practice their roles as citizens and struggle to reduce the probability of abuses.

Another argument against cloning condemns the mere instrumentalization of a human individual (see the GAEIB), inscribed in the Kantian imperative according to which "*man, and in general all rational beings, exist as an end in themselves, not as a means for some use according to this or that will;* [and should] *therefore always be considered an end at the same time*" (Kant, undated:78). Such would be the case of human individuals produced to serve as mere organ and tissue banks, which obviously is morally unacceptable, just as the above-mentioned example (4) would be unacceptable. That is, in case human clones actually existed, they would also be persons and could thus not be used as mere means to serve third parties. However, we should also point out that a certain degree of instrumentalization tends to be a part of any interpersonal relationship, especially between parents and children, teachers and pupils, and employers and employees.

There is also the possibility of intentionally creating decerebrate human clones, who would thus not be properly human and would not suffer any pain. But this case is still in the realm of science fiction, and albeit intuitively repugnant, it would depend on advances in our knowledge and trends in the morality of future generations.

Summing up, the risks are obviously many, and we would say proportional to the benefits, but this does not prevent one from beginning to ask if there might not be good reasons for the cloning of given human traits, as long as one proves their need for the improvement of quality of life for human individuals and populations, respecting the dialectic of *prima facie* principles of beneficence and non-maleficence (which have been the foundation of 'correct' health intervention since Hippocrates), respect for autonomy and free, informed consent, justice, and others which may come to be needed in order to live well.

## Conclusion

The cloning of human beings, organs, and tissues requires much research and forecasting on its possible developments in health and human terms. In this sense, in the current stage of our knowledge, it is worthwhile to recommend healthy prudence, including preservation of the existing biodiversity, resulting from sexual reproduction. But in specific cases, one could well suppose that scientific and cultural 'diversity' itself (like that resulting from the cloning of the resistant characteristics quoted in our example) might come to join, complement, and improve existing biodiversity.

The moral analysis of cloning, in turn, rests on two questions: 1) are there good reasons to apply cloning to human beings, such as health reasons, regardless of whether or not cloning appears intuitively repulsive? 2) what types of reasons might these be, and what is their degree of cogency?

In fact, the *pars destruens* of arguments against cloning is an easier task than the *pars construens* (Callahan, 1997b; Harris, 1997), since we still have no clear, elaborate ethical position in favor of it, but mere deconstruction of arguments to the contrary. However, in order to begin to construct this missing theory, one should take due notice of the *right to procreative autonomy*, consisting of people's right "*to control their own role in procreation unless the state has a compelling reason for denying them that control*" (Dworkin, 1993 apud Harris, 1997:358), which would justify reproduction by cloning for therapeutic ends, and the moral principle cited by Harris according to which "*it is better to do some good than to do no good*" (Harris, 1997: 355). In short, "*In the absence of compelling arguments against human cloning, we can bid Dolly a cautious 'hello'*"(Harris, 1997:359).

In conclusion, integrating the natural sphere through the cultural sphere, we are merely continuing on our path to hominization, which depends upon (amongst other things) biotechnoscientitic competence and cloning of characteristics that may become imperative for the very survival of the human species and its conquests, including the survival of the freedom to decide on the most adequate forms of reproduction. In this case, cloning would not target immortality, which would only be possible outside the realm of time, since as Emile Marie Cioran suggests, "*having fallen into time due to ignorance, we were simultaneously provided with a destiny, because destiny only exists outside of paradise.*" (Cioran, 1964:12).

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