



Bioethical Considerations on Cloning and Twinning

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The subject of cloning has had a deep impact on both public opinion and the scientific community, asking themselves about its meaning, its possible extension to humans, its potential applications and implications.

Cloning was often presented by the media as a technique that would allow perpetuating oneself.

The resulting impact of cloning on public opinion might be interpreted, in part at least, as making real the dream of reincarnation.

In the Christian faith cloning, as a hypothesis of reincarnation, has no place, since the soul is already immortal, while the body dies (excepting its reunion with its soul on the resurrection of the last day).

Thus a person's immortality is a dogma of faith for the believer, but only as immortality of the soul, that will rejoin its body only at the end of earthly time, while in our "earthly time" the body is mortal.

The body's mortality is part of natural biological processes. Only in primitive organisms, such as bacteria, and in organisms reproducing through scions or similar processes (as farmers and florists well know) it is harder to set a definite moment for the birth or death of a single individual. But in sexually reproducing higher organisms, such as we are, the cycle of individual life is clearly encompassed and expressed by the well-known sequence whereby each individual "is born, grows, reproduces and dies".

If we consider the *individual* in all its manifestations – what we geneticists call the "phenotype", resulting from the interactions between genotype and environment – each subject is undoubtedly endowed with his individuality.

The repetition of the very same genotype does not mean repetition of the same individual, as clearly evidenced by the observation of identical twins (monozygotic, i.e., both derived from the same fertilized egg, the zygote) who, much as so closely resembling each other, are each endowed with his or her unique individuality.

The scientific term "cloning" is related to the concept of "clone". A clone is the plurality of individuals (cells or organism), all alike, derived from its founder, through mitosis, gemmation or fission.

In this sense, identical twins do represent an instance of “natural” cloning. Yet such “cloning” can also be obtained today artificially and, as an example, in farm animals it is now possible to resort to this technique in order to increase the number of fetuses, thus obtaining higher yields per pregnancy.

Let us note, at this point, that the rising incidence of sterility in our populations, with the resulting diffusion of assisted procreation techniques (especially forcing ovulation by hormone treatment), has caused an excess of plural births – often with serious social, economic and health problems – but these are *non*-identical twins and thus *not* cases of cloning.

Let us note, incidentally, that the survival of the recent Iowa septuplets does represent an exceptional medical accomplishment, but their prematurity may have serious consequences later in life; also, their exceptionality has attracted public attention and support, relieving the difficulties that parents of “supertwins” normally face, but such public attention risks negatively affecting the psychological development of the septuplets, as warned (on the basis of their similar experience) by a survivor of the famous Dionne identical quintuplets.

The hypothesis of human cloning that is currently at the center of scientific and ethical debate concerns the transposition to our species of the technique that, beginning with experiments on amphibia, was recently successfully applied to the case of the sheep “Dolly” in Scotland.

The schematic representation of this technique entails removing the genome-containing nucleus from a zygote, injecting in its place the nucleus of a somatic cell of the person to be duplicated.

In theory this appears quite straightforward: the genome of the resulting individual would be that of the nucleus donor.

Yet in practice things are not that simple. On the one hand there is what we call “extranuclear inheritance” (largely represented by mitochondria and ovular RNA’s) which is of maternal origin, carried in the ovular cytoplasm: much as secondary to nuclear inheritance, it will differ from that of the individual to be duplicated. On the other hand the nucleus of an adult’s cell has undergone a series of conditioning influences (from “imprinting” to regulation, characteristic of the differentiated cell), making it functionally different from the nucleus of a zygote.

In effect the now famous Dolly was obtained by substituting the nucleus of an ovum (subsequently stimulated to divide) rather than a zygote, after having submitted the donor nucleus to specific “deconditioning”.

Apart from the complications of the technique, into which we shall not delve any further, the main problems are the feasibility and lawfulness of such cloning in humans.

Once established, on the basis of the example of identical twins, that in any case an individual thus cloned would *not* be an exact copy of the nucleus donor (due to the different extranuclear inheritance and unrepeatable environmental influences, starting with uterine environment), the prospect of human cloning poses a series of problems that deserve to be carefully appraised.

It seems proper to summarize here the first conclusions reached by the expert commission appointed in the U.S. by President Clinton:

- it is currently unacceptable for anyone, whether public or private, to attempt to create a child by cloning, through the nuclear transfer from a somatic cell;

- the use of these peculiar techniques might imply unacceptable risks for the fetus or potential child;
- at present such an attempt, and the implant thereof in a woman, would be an irresponsible act, ethically and professionally negative;
- it is recommended that federal legislation should forbid such cloning (with possible provisions for reconsideration in three or five years);
- yet the proposed legislation should not interfere with cloning at the level of human molecules or cells, nor at the level of animal cloning;
- in any case any potential future clinical application should be preceded by controlled experimentation, according to current norms for experimentation on man (the so-called “good clinical practices”);
- the U.S. government should cooperate with other nations and with international bodies in the application of common rules in this field;
- ethical and religious positions in this field are not uniform; further initiatives are recommended in any case to improve the understanding of the ethical and social implications of this technology;
- it is recommended that all scientific bodies cooperate in identifying and developing any occasion to inform and educate the public in the field of genetics and other developments, in the biomedical sciences.

It should be further observed that, beyond the cloning of Dolly by the transfer of the nucleus of a somatic cell from an adult sheep (of a race different from the ovum), other experiments have been already carried out through the nuclear transfer of *transgenic* sheep *fetal* cells, into which human genes had been previously inserted, aiming at obtaining animals producing human proteins. Here we face another serious ethical problem: should the same technique be applied to human procreation, it might generate a sort of unacceptable child supermarket (some anticipation of which seems to be already in the offing...).

We should also remember that Nature, through the mechanisms of evolution, has determined the vital, reproductive and social characteristics of our species; the changes that the new biomedical technologies – but also the new social habits – can introduce in our reproductive processes (including the techniques of assisted procreation, but also the revolution or reduction in parental care, with the gradual reduction or outright elimination of the family’s role, dimension and duration (an issue on which we shall return) risk having destructive effects on the future of the human species.

Let us welcome the advice (by the U.S. Presidential Commission on cloning) that wider information and education be provided to public opinion on biomedical developments and technologies – especially in the field of genetics – in order to allow the advent of a collective bioethical conscience, orienting the choices between what is permissible and what is not, in the application of the new technologies.

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