January 2002
Curriculum Supplement

on the topic of

The Cloning of Human Beings

as prepared by the staff of

The Interim

There are few developments with greater portent than the spectre of the cloning of human beings. This supplement is devoted to this topic, especially its ethical dimensions. Excerpts have been selected from a variety of sources, but with a pronounced preference for those which espouse a Christian dimension. The questions which accompany the readings are intended to stimulate thinking and further research.

Teachers of religion, biology, family studies and social sciences will find the material most useful. However teachers wishing to learn more about the topic should also be encouraged to access the supplement.

Given that our own national Parliament has not yet passed legislation regulating this field of research, the general public, and students in particular, still have a wonderful opportunity to intervene and give their views and advice. Whatever the resulting legislation, it should respect the sanctity and dignity of all human life, however it begins.

CLONING RESOURCES

Vatican and Other Reactions

On November 25, 2001, a Massachusetts research company announced it had cloned the first human embryo. The announcement from Advanced Cell Technology Inc. brought swift condemnation from the Vatican and from political leaders, including U.S. President Bush.

``Notwithstanding the humanistic intents...this calls for a calm but resolute appraisal which shows the moral gravity of this project and calls for unequivocal condemnation," the Vatican said in a statement.

The Vatican said cloning violates Catholic teaching that life begins at conception and shows a disrespect for humanity. . . .``What we have before us are human embryos and not cells...life which must preserve its dignity like every other human life," the Vatican said.

Researchers defended the development by saying they wanted to use the cloned embryos to harvest stem cells, rather than to create babies. Many scientists believe stem cells can be used to treat a wide range of diseases, including diabetes, strokes, cancer, AIDS and neurodegenerative disorders such as Parkinson's and Alzheimer's disease.

The scientists who conducted the experiment said they opposed growing a cloned embryo into a human being. They said that cloning embryos would enable stem-cell research without creating new embryos from human eggs and sperm.

President Bush also criticized the experiment, saying, "We should not as a society grow life to destroy it, and that's exactly what's taking place."
www americancatholic.org/news/cloning

Questions

1. Why is cloning controversial?
2. Why did the Vatican condemn the announcement re cloning?
3. On what basis did the Vatican condemn the cloning process?
4. What “justification” did the scientists who conducted the experiment give for their research?

The Ethics of Cloning

Russell B. Connors Jr.

"My, this is clever!" . . . But is it a good thing to do? Can the cloning of sheep or even of humans one day be considered part of stewardship? Are there limits to what we might do in the name of ingenuity, intelligence and creativity?

The possibility of cloning—producing genetically identical copies of a single living organism—has fascinated scientists for some time.

Enter Dolly, hailed as the first mammal to develop from a cell derived from an adult, differentiated tissue. Specifically, Dolly is the genetic clone of a Finn Dorset ewe.

If and when these procedures become mastered, it would be possible to select the finest and fittest of our sheep, horses, cows and, yes, humans, and then to produce clones of these champions. In this way, cloning would become the surest form of genetic engineering. Amazing.

But amazement isn’t enough. Is it a good thing to do? What does any of this look like in the light of Christian faith?. . . .

There is truth to the idea that the artistic act begins not with what one does, but with what one sees. I suggest the same is true of ethics, including Christian ethics. Morality is not first and foremost about what we do, even though what we do is very important. Most fundamentally morality is about what we see; it is about how seeing leads to living.

Christian faith thus shapes our morality. . . . Our faith serves as a lens through which we can see what is important about what is going on, and then begin to discern what is to be done.

God's Call: Be Stewards

How might some of the things we believe as Christians influence how we view cloning? The convergence of three features of our faith—our vocation to stewardship, our call to co-creativity and our commitment to reverence for life—provides a lens.

First, we are called to be stewards of all creation. Our gifts of intelligence and creativity mean that we human beings have a special role to play in caring for the rest of creation.

Stewards must be neither too timid nor too bold. Stewards know they are not creators or owners. What is entrusted to their charge is not their possession. We may be intelligent—indeed clever—but we must be mindful that what we have received we have received as gift from the creator.

God's Call: Create

In addition to being stewards, we are called to be instruments of God's creation. . . .Although God is and remains the creator, God has chosen to use humanity (as God did in and through Jesus) to be instruments of God's ongoing creativity in this world.
This new order involves not only humanity, but all of God's creatures. The new creation will be God's doing but, astonishingly, it will come about in and through the work of human hands. In this sense we are co-creators of God's new heaven, God's new earth. . . .
Reason and faith ought never to conflict. Both have their origin in God. . . . We shouldn't be suspicious of science and technology. The test is whether or not a new scientific achievement can be found to be compatible with God's creation.

Is it designed to cure, to heal or to ease the pains and scars of humanity or of the earth itself? . .

God's Call: Revere Life

Finally, we are called to reverence the gift of life, particularly human life. All that has been created is the handiwork of God. Thus, as the poet Gerard Manley Hopkins put it, "The world is charged with the grandeur of God."

Anyone who has ever been brought to silence by the beauty of the autumn trees, or been awed by the dearest freshness of a newborn baby knows this. For those of religious faith, the world is not only beautiful, but also holy. It is not only to be respected, but reverenced as well.

God, it seems, has a special care for the life and well-being of those who are most vulnerable. So God hears the cry of Israel and God responds to their needs and begins to fashion a holy people. Consistent with that, Israel's prophets often remind the people that their greatness should be measured by their care for the widow and the orphan, the enslaved and the estranged.

Jesus displays the same commitments. He regularly chooses fishermen for followers, outcasts for friends and sinners for table-mates. In word and deed, the ministry of Jesus makes it clear that the life of every human being is of immeasurable worth. Reverence for life, especially the most vulnerable of persons, marks the ministry of Jesus. It is the call for all who follow him . . . . The call to revere life in all its forms gives us a way of seeing and assessing scientific achievements like cloning.

Cloning Humans: No Way

What, then, shall we make of cloning? Seen through the lens of our faith, in light of Catholic teaching and tradition, does it fit with our call to stewardship, co-creativity and reverence for life?

The possible cloning of human beings has been roundly decried by Catholic theologians, ethicists and the hierarchy as immoral. Consider the Vatican's 1987 *Instruction on Respect for Human Life in Its Origin and on the Dignity of Procreation*.

The first part of that document addressed questions related to the moral status of the human embryo. It reasserted the Church's fundamental conviction that human life begins with the fertilization of the egg by the sperm. From that point forward the embryo should be respected as a person. Accordingly, not only are interventions that result in the destruction of human embryos morally inappropriate, but so too are experiments that impose "grave and disproportionate risks upon embryos obtained in vitro" (in a "test tube").

Concerning cloning itself, the Vatican Instruction is clear in its assessment: "Also, attempts or hypotheses for obtaining a human being without any connection with sexuality

through ‘twin fission,’ cloning or parthenogenesis are to be considered contrary to the moral law, since they are in opposition to the dignity both of human procreation and of the conjugal union."

Most fundamentally, cloning seems not to fit with our call to reverence human life, particularly in its most vulnerable stages. Relating this to the procedures used in the cloning of Dolly the sheep, Dr. Wilmut reported that, out of 277 attempts to fuse the two cells, only 29 embryos survived longer than six days, and only one live birth—Dolly—resulted.

Currently at least, the success rate in attempts at human cloning would not likely be better. Since human life begins at conception, these procedures fall far short of the kind of reverence for life which our tradition upholds.

Cloning or other experimental procedures carried out on human embryos involve their necessary or even deliberate destruction. The Instruction explains: "By acting in this way the researcher usurps the place of God; and, even though he may be unaware of this, he sets himself up as the master of the destiny of others...."

Part of what is wrong with human cloning is that it does not fit with our charge to be stewards of creation, but rather seems to involve an inappropriate form of manipulation and domination.

Another concern of the 1987 Vatican Instruction with human cloning is that it takes reproduction out of the context of human sexuality. A human being may be brought into this world totally independently of the sexual intimacy of a loving, committed couple.

Cloning human beings independently of any kind of interpersonal relationship is not the kind of co-creativity Catholic tradition teaches as God’s will.

Moral theologian Father Richard McCormick, S.J., has consistently argued that science and technology must be assessed by the manner in which they serve human persons. He told Time magazine, "I can’t think of a morally acceptable reason to clone a human being." I concur.
www.americancatholic.org/Messenger/Mar1998/Feature2.asp

Questions

1. Is cloning “the surest form of genetic engineering”?
2. What does Connors mean by the “lens of faith”?
3. How should these faith features--stewardship, call to co-creativity and reverence for life-- influence one’s view /understanding of the cloning issue?
4. How does the cloning of human beings through whatever process or research procedure contravene the clear teaching of the Church?

Statement by the Vatican on Cloned Human Embryo

"The original article in the magazine '*The Journal of Regenerative Medicine*', that the researchers of Advanced Cell Technologies published with the date of November 26, 2001, shows in all its dramatic nature the gravity of the event that has been realized: the in vitro production of a human embryo, as a matter of fact, several embryos, that have been developed, respectively, to the stage of two, four and six cells.
"The authors repeated that their intention is not to give rise to a human person. But what is it that they, as scientists, call in their article 'early embryo', an embryo in its initial stages? Here we have the bioethical question of 'when does human life begin' returning once again as a topical matter, though in all truth, this is a question that has never abated. Beyond the scientific event, in fact, this remains as the object of contention, being beyond doubt - as indicated by the researchers themselves - that here we find ourselves facing human embryos and not cells, as some would have us believe.

"The event therefore, powerfully, brings us to repeat with force that the beginning of human life cannot be fixed by convention at a certain stage of development of an embryo; it exists, in reality,at the very first instant of existence of the embryo itself. This is understood more easily in the 'human' method of insemination between egg and sperm, but we must learn to recognize it also in the face of an 'inhuman' method, such as that of the reprogramming of a somatic nucleus in an egg cell; even with this method a new life can be created - as shown unfortunately in the experiment that was announced - a life that preserves, in any case, its dignity just as that of every human life brought into existence.

"Therefore, notwithstanding the declared 'humanistic' intentions of those who announce amazing cures through this method, that will go via the cloning industry, a calm but firm evaluation is necessary that will show the moral gravity of this project and motivate its unequivocal condemnation. The principle that de facto has been introduced, in the name of health and well- being, sanctions, in fact, a true and proper discrimination among human beings based on the measure of time of their development (thus an embryo is worth less than a fetus, and a fetus less than a child, a child less than an adult), overturning the moral imperative that imposes, instead, the greatest care and

maximum respect precisely of those who are not in a condition to defend themselves and to show their intrinsic dignity.

"On the other hand, stem cell research shows that other paths are available, morally licit and valid from a scientific point of view, such as the utilization of stem cells that have been taken, for example, from an adult individual (there are many in each one of us), from maternal blood or from fetuses that were aborted spontaneously. This is the path that every honest scientist must follow to the end of reserving maximum respect for man, that is, for himself." **www.americancatholic.org/news/cloning**

Questions

1. Why is this statement central to the controversy: "The beginning of human life cannot be fixed by convention at a certain stage of development of an embryo"?
2. Why is the status of the embryo of great interest and concern? What are the two main arguments about the status of the embryo?
3. Is it acceptable to reprogram a human embryo so that instead of producing a baby, it develops only into certain types of cells?
4. Are there viable alternative therapeutic methods which could avoid using embryos?
5. What are the principal arguments against the cloning of human embryos for whatever purpose?

The Genetic Revolution: Ethical Issues

Ernle W.D. Young

And here, of course, there are two categories that have to be delineated. The one is what is called somatic cell and the other is germ line therapy. Somatic cell is treating the individual at the cellular level to correct a genetic deficiency. For example, if it becomes possible to do some genetic engineering in the near future, it may be possible to treat individuals who have diabetes not with insulin injections but by introducing the gene that expresses insulin, which they lack, into the pancreas. So that they will in fact be able to produce the insulin within their own bodies, without having an exogenous source of insulin either in injection or now in inhalation form.

But germ line therapy is very different, because when you get into the germ line, you make changes not in the individual alone but in that individual's progeny, not only for this generation but for generations to come. In other words, we begin to intervene directly in the evolutionary process. And this can happen in two ways, one negative and the other positive.

Eugenics and negative germ line therapy:

An example of negative germ line therapy would be removing from the human gene pool those genes that we consider to be deleterious . . . I think a consensus is emerging that we want to reserve, if we get into it at all, germ line therapy only for very serious maladies. That is to say, conditions that are usually fatal and cause indescribable pain and suffering. Those are tragic conditions. It may be appropriate to try to rid the human gene pool of these. But even that is fraught with ambiguity. . . Because many of these so-called genetic diseases may mask or hide or conceal some kind of evolutionary benefit for the species. Who knows?

What is positive eugenics?

Positive eugenics means adding to the human gene pool so-called desirable characteristics. And that immediately raises the question, desirable by whom? We had one experiment in positive eugenics in the 20th century, namely in Nazi Germany, where not through genetic engineering but through selective breeding, the State, the Third Reich, decided to introduce desirable characteristics into the gene pool, not only eliminating what they considered the "undesirables"--homosexuals, gypsies and Jews-- but then selectively bred Aryan blonde, blue-eyed women and men.

About Cloning

Don't lose sleep over cloning nightmares… I think it would be impossible to clone dozens of Hitlers, or for that matter, scores of Michael Jordans or Albert Einsteins or Marilyn Monroes, if we could get their genes. For the simple reason, that personhood is not an event but a process. That is to say, becoming the persons we are is the result of a very complicated and ongoing process. We are all works in progress, if you like. And that process involves human DNA, which certainly is replicable, as well as an environment or series of environments, and the responses we each uniquely make to these various environments - in other words, our choices.
And neither the environments nor the choices that we make in response to these environments are replicable. . . . That makes it impossible, in my view, to clone, as that editorial put it, "hordes of drones to perform menial work." Because even if the checks and balances of a democracy were absent and the cloning were done in some totalitarian state, the persons to be cloned would be persons first and drones only second.. . . So, that particular nightmare does not haunt me but I do have some concerns about cloning.

What about failed cloning experiments?

One has to do with the question of failed experiments. It took 277 attempts to produce Dolly. . . But among the failed attempts, there were several sheep born that were profoundly malformed and had major birth defects. Now,

it's easy to say, when you have a baby lamb born with malformations or genetic or other defects . . . let's just get rid of that. But if this were done on a human population, what would we do with the failed experiments if it took 277 to produce one success?

We are, as a state, and maybe even as a country, cutting back on institutional services for the disabled. That is to say, many of those with profound developmental disabilities or delays or deficits are no longer eligible for state support. Their parents have to make private arrangements. So what would we do with the failures?

The technological imperative…

Then I have another concern, and that has to do with what is often called the technological imperative in general and about the advanced reproductive technologies in particular. The notion that something can be done all too often leads to the complementary idea that it should be done. We are seeing this now particularly with the advanced reproductive technologies. The fact that a 65 year old woman can be enabled to give birth to a child, in the minds of some at least, means that it should be done.

But the advanced reproductive technologies are really moving forward and I worry about that because of the old religious notion that there's a difference between procreation and reproduction. Yes, procreation and reproduction. There is a difference. Procreation is a uniquely human process. Reproduction is sort of a technological process. And I worry that the line between reproduction and procreation is going to be even further blurred.
www.accessexcellence.org/AE/AEPC/BE02/gentest/gentoc

Questions

1. What is meant by somatic cell therapy and germ line therapy? How do they differ?
2. Define positive and negative eugenics. Is either acceptable? Why or why not?
3. Why does E. Young not "lose sleep" over cloning "nightmares"? Do you share his optimism?
4. What aspects or ramifications of human cloning do worry him? Do you agree with his point of view? Why or why not?

SURVEY OF BIOETHICAL ISSUES

as adapted by *Interim* staff from the original survey of Jon Fiorella

Fiorella believes that the survey works best if it is presented to the students on the first day of the course. If the students are confused by the wording or meaning of a statement have them check off Not Sure, but don't explain the meaning of the statement at that time. Once the relevant unit or entire course has been finished, give them a clean survey and have them fill it out again. Next compare the pre and post teaching results. Look for any changes in attitude. Another interesting twist is to give the students an extra copy for their parents to complete. It might be instructive to compare the attitudes of the parents to that of the students. Yet another approach is to have fellow staff take the same survey to again compare their attitudes to that of the parents and students.

The Survey

The following statements deal with bioethical issues that will be discussed in class during the semester.
Please circle the response that corresponds to your viewpoint.

1. The wise allocation of scarce medical resources is a necessity in Canada.
AGREE NOT SURE DISAGREE

2. Animal experimentation is needed if medicine is going to advance.
AGREE NOT SURE DISAGREE

3. Genetic counselling should be a requirement for all prospective parents.
AGREE NOT SURE DISAGREE

4. Advanced research in science and technology should be controlled by "society".and not just left to scientists.
AGREE NOT SURE DISAGREE

5. Defective newborns should be allowed to live just like others.
AGREE NOT SURE DISAGREE

6. Euthanasia must remain illegal.
AGREE NOT SURE DISAGREE

7. Research using fetal tissue is not acceptable and should be outlawed.
AGREE NOT SURE DISAGREE

8. Surrogate motherhood should be outlawed.
AGREE NOT SURE DISAGREE

9. The genetic engineering of new strains of plants and animals is acceptable.
AGREE NOT SURE DISAGREE

10. It should be legal to buy and sell organs for transplantation.
AGREE NOT SURE DISAGREE

11. Reproductive technologies create more problems than they solve.
AGREE NOT SURE DISAGREE

12. Sex selection of offspring should not be allowed.
AGREE NOT SURE DISAGREE

13. The courts should not be called upon to settle bioethical issues.
AGREE NOT SURE DISAGREE

14. We should discourage research on the cloning of humans.
AGREE NOT SURE DISAGREE

15. The Canadian Parliament should ban embryonic stem cell research
AGREE NOT SURE DISAGREE

16. All forms of human cloning should be declared illegal
AGREE NOT SURE DISAGREE

www.ajobonline.com/hsbioethics

A View of Human Reproductive Cloning: Christian Doctors in the U.K.

As Christian doctors our intuitions about this are overwhelmingly powerful - at a conference this year to discuss cloning issues, only one of the 50 or so CMF members participating was prepared ever to consider the possibility of such cloning being ethical. We feel that the deliberate production of genetically identical human beings crosses the boundaries of our conviction stated above that 'God is the Creator, the Sustainer and the Lord of all life'.
The uniqueness of each human individual, made 'in the image of God', is another key concept. . .
A third key concept is that children should be a gift of God within marriage, thus establishing the family as the fundamental unit for the stability of society. . . . reproductive cloning takes technological manipulation of human relationships and reproduction a quantum leap further. . . .Despite the powerful emotional pressures to respond thus to the pain of infertility, we would continue to urge that the deliberate creation of genetically identical human beings should remain prohibited.

Further, it can perhaps be argued that individuals have a right to a genetic identity distinct from that of each of their parents, thus ruling against any move towards the treatment of infertility by cloning from an adult cell of the mother.

Finally, what would be the motive of anyone wanting to create a 'carbon copy' of them self as a treatment for infertility? The child would be created to fulfill a function, not to be loved for himself or herself.
Christians do however take seriously the concept of a natural moral order within the world of human relationships and wish therefore to use technology so as to uphold this natural moral order rather than to weaken it.
Christian Medical Fellowship
April 1998

Questions

1. Briefly summarize the basic arguments which these British doctors use in their opposition to any form of human cloning?

www.cmf.org.uk/ethics/subs/clone

Other useful internet sites for the study of biology and biotechnology.

For a complete course outline on the teaching of bioethics see the American source of Genevieve M. Nelson. She makes an excellent case for incorporating bioethics into the biology curricula. She goes further by providing several methodologies, with suggested topics, for example: case studies; debate; panel discussion; role playing; journal writing; and student-led seminars. She also outlines certain steps which would be common to all the methodologies employed.
www.accessexcellence.org/21st/TL/TBE

A university students site, with regular newsletters on big “life” issues. Very politically active in Britain.
www.studentlifenet.org.uk

A practical site for the teacher is that of MR. BIOLOGY. This site contains class notes on topics, sample exams, links to biology sites, classroom worksheets, transparencies, and Advanced Placement curriculum and labs.
www.sc2000.net/~czaremba/

For a genetic engineering lesson plan complete with objectives, materials, procedures, etc., go to
www.public.asu.edu/~langland/genetic-engineering

For material specifically dealing with the definition of “cloning” and its application within nature as well as more particularly in the field of human genetics you may wish to read Rosa Beddington’s essay on CLONING at
www.nimr.mrc.ac.uk/MillHillEssays/1997/cloning.htm
There is an excellent essay which gives an historical overview of the genetic revolution. This essay by Joan Carlson may be found at the site of The American Journal

of Bioethics. Although the essay has not been reproduced in this supplement, we are including questions which could help the teacher if assigning the essay as an additional resource.
www.ajobonline.com/hsbioethics.

Questions:

1. What role did each of these researchers/scientists play in the development of "genetics"?
(a) Gregor Mendel (b) Charles Darwin (c) James Watson & Francis Crick.
2. Define these terms (a) recombinant DNA (b) gene therapy.
3. How safe is recombinant DNA research as we genetically engineer crops to withstand frost and insect pests or add genes for enzymes which prevent fruit from spoiling too fast?
4. Will these genetically engineered crops be safe for consumption? If herbicide resistance is built into crops will the farmer use more herbicide to get rid of the weeds, and thereby threaten ground water drinking supplies?
5. What can students and the general public do to keep genetic technology under close scrutiny?

Also to be found on the American Journal of Biology site is a link to other quality American, British and world sites dealing with biology issues.

www.ornl.gov/hgmis/elsi/cloning

www.religioustolerance.org/cloning.htm

www.newscientist.com/hottopics/cloning/

www.sciam.com/1998/1298issue/1298wilmut

www.usfca.edu/cloning

www.cmf.org.uk/ethics/subs/clone

www.bioetica.org

www.dspace.dial.pipex.com/srtscot/cloning

Somatic Cell Nuclear Transfer (SCNT) Method of Cloning

First explored by Hans Spemann in the 1920's to conduct genetics research, nuclear transfer is the technique currently used in the cloning of adult animals. All cloning experiments of adult mammals have used a variation of nuclear transfer.
A somatic cell is any cell other than a sperm, egg, or cell that gives rise to a sperm or egg. Nuclear transfer requires two cells, a donor cell and an oocyte, or egg cell. The nucleus of the egg (containing its DNA) is removed and replaced with the nucleus (and its DNA) of a somatic cell (such as skin or blood) from the recipient. Research has proven that the egg cell works best if it is unfertilized, because it is more likely to accept the donor nucleus as its own. The egg cell must be enucleated, which eliminates the majority of its genetic information. The donor cell is then forced into the Gap Zero, or G0 cell stage, a dormant phase, which causes the cell to shut down but not die. In this state, the nucleus is ready to be accepted by the egg cell. The donor cell's nucleus is then placed inside the egg cell, either through cell fusion or transplantation. The egg cell is then prompted to begin forming an embryo. (To harvest stem cells, the egg containing the transferred nucleus is encouraged to divide until it reached the blastocyst stage, at which time the cells of the inner cell mass are removed and cultured. These are known as embryonic stem cells, or ESC's.) The embryo is transplanted into a surrogate mother if stem cells are not the goal. If all is done correctly, occasionally a perfect replica of the donor animal will be born.

See diagram on page 8.

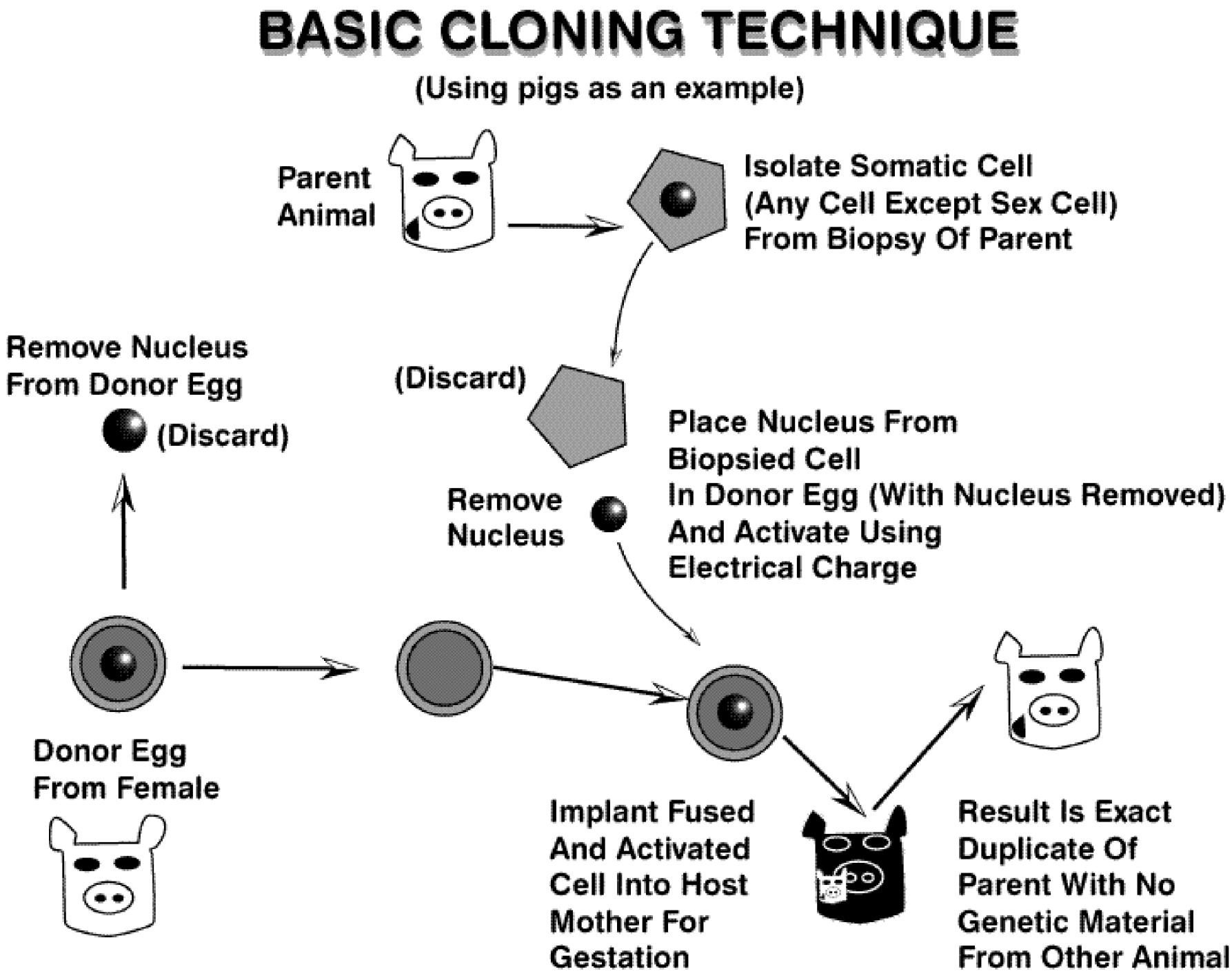

Diagram by David Bolton, Interim Publishing