

Bioterrorism, Embryonic Stem Cells, and Frankenstein

PATRICK GUINAN

ABSTRACT The stem cell controversy raises a fundamental question for humankind: Does science have a right to pursue knowledge whatever the cost? Our Enlightenment culture says yes. However, human history and literature are sending warning signals. Ethical issues impact the "knowledge for its own sake" imperative, and must be addressed.

KEY WORDS embryonic stem cells Frankenstein, bioterrorism

Contemporary scientific dilemmas

On November 1, 2001, an article¹ appearing in the Chicago Tribune indicated that a super virulent strain of a microorganism could, and by implication would, be created by scientists. Technical advances, developed in part for the Genome Project, would allow the genetic sequencing of the smallpox and ebola viruses such that, with "tailoring," they could be combined into a super-pathogen that would cause both diseases simultaneously. Given the current technology this achievement could be accomplished, unlike the Manhattan Project, which required many Nobel caliber scientists and billions of dollars, by a single scientist in a modest laboratory in a short period of time.

The recent (October 2001) terrorist anthrax attack caused an unprecedented public health crisis in the United States. A super-germ attack would make the anthrax episode pale in comparison. Would it not be prudent, for ethical reasons, to restrict, by legislation if necessary, scientific research on a super-pathogen? Simply stated, does the potential human harm not render the fulfilling of either scientific curiosity or malice morally indefensible?

But can we forbid, or even limit, scientific inquiry of even the most damaging kind? Embryonic stem cell and cloning research is a case in point. Cloning is technically feasible and relatively inexpensive. Humans, as well as all other organisms, are made up of cells of varying functional capacity. Skin

Dr. Patrick Guinan is an associate professor in the Department of Urology of the University of Illinois Chicago College of Medicine. He has over 200 published articles and book chapters. He is a practicing surgeon and has an interest in bioethics. He serves on the Ethics Committees of both the University of Illinois and Cook County Hospitals.

cells, liver cells, blood cells. All human cells are derived from a human ovum and a sperm, both comprised of 23 human chromosomes, that join to become a single cell of 46 human chromosomes. That cell is a person (by definition a "human being"),³ in the fullest sense, just as the live Dolly was self-evidently a ewe in the undeveloped single cell (that inexorably grew into an adult sheep) cloned by Dr. Wilmut.

There is much cellular differentiation in the process of growing from an embryo to an adult. The earlier cells, embryonic or stem cells, obviously have the potential to grow into different tissues. There are laboratory techniques to culture, or grow, from the first, or totipotent cell, any desired cell: skin, liver, or blood. In lower animals, such as the mouse, embryonic cells can be tailored into specific tissues, say nerves, that can be employed to replace damaged nerves in other mice.

Can this be done for humans? Yes, but there are serious ethical questions involved. First, human embryonic stem cells are derived from blastocysts which are developing human persons who would be killed in the pursuit of these stem cell investigations. Secondly, cloning, or the insertion of a somatic cell nucleus of 46 human chromosomes into an enucleated egg results in an admixture of the somatic cell DNA and cytoplasmic mitochondrial DNA of the egg, which could result in permanent deleterious human germ cell line alterations. These genetic changes could be transmitted, knowingly or unwittingly, to future generations.⁴

Of concern is the fact that the scientific community opposes limitations on lethal biologic agent investigations⁵ and also, rather overwhelmingly, favors embryonic stem cell and cloning research.⁶ One assumes that the research community would also oppose limitations on investigations of potential superpathogens.

Presumably the enthusiasm for the embryonic stem cell and cloning research is because of its potential benefit in high profile diseases such as spinal cord injuries (Christopher Reeve) and Parkinson's disease (Mohammed Ali). But is concern for human suffering the real motivation for embryonic stem cell and cloning research, or is it rather, the scientific and technologic imperative? This principle assumes that because we can know and do something we are justified, or even compelled, to know and do it. Is there not an element of human hubris at work here? This question calls to mind the Frankenstein myth and reopens the issue the unrestrained pursuit of human knowledge and the limits, if any, on this quest.

Frankenstein

Frankenstein of course is the scary monster killer popular in Western culture. Actually Frankenstein was not the monster but, ironically (and with

poetic justice) the scientist who created the monster in Mary Shelly's book "Frankenstein, or the Modern Prometheus"

Dr Frankenstein is a paradigm for many literary figures who have usurped the quest for knowledge. Another, Johann Faust, who was an alchemist, or one who used knowledge in an attempt to convert baser metals into gold, was the inspiration for Dr Faust who in Marlowe's play sold his soul with unfortunate consequences to Mephistopheles, the devil's agent, for forbidden knowledge.

Drs Frankenstein and Faust are but more recent creations of a theme recurrent from the beginning of literature. Adam and Eve ate the fruit of the tree of knowledge that God had forbidden them. They were banished from paradise and subjected to suffering and death. Lot's wife and Pandora were both curious, the former as to what was to happen to Sodom and Gomorrah and the latter as to what was in the box entrusted to her. Curiosity and the desire for forbidden knowledge led to dire consequences in all of these cases. There appears to be an innate sense of some limitations on human knowledge reflected in literature. Perhaps man cannot be omniscient.

Why is there this recurring theme of retribution for the pursuit of unrestrained or forbidden knowledge in our literary heritage? Could it be that the human mind senses the existence of a supreme being, God, and desires to share God's all encompassing knowledge? Since God is all knowing, knowledge of sacred phenomena (such as fire in the case of Icarus) would make man more God like. This drive has created a tension between the reality of the limitations on human knowledge and the Pelegian hubris of humans wanting be equal to God.

The Enlightenment project gave Western culture inductive science and with it a renewal of the quest for complete knowledge. Never before has man had in his possession so much information. It has been estimated that the sum total of knowledge doubles every fifty years. This increase is becoming logarithmic rather than arithmetic.

Opinion polls consistently suggest that the general public, as compared to scientists, is opposed to cloning research. But while society senses that some knowledge and technical accomplishments are beyond the pale, some biologists will not be restricted. The tension between man's desire for knowledge and the self-evident limitations of the human capacity to deal with the knowledge he has is nowhere more evident than in the dilemma of nuclear power.

The nuclear scientists, exemplified by Robert Oppenheimer, were tempted by their capacity to produce destructive power, considered not doing so, but ultimately were incapable of restraining themselves. In a lecture in 1947 Oppenheimer stated, "physicists felt a particularly intimate responsibility for suggesting, for supporting, and in the end, in large measure, for achieving the realization of atomic weapons." For this he continues, "physicists have known sin, and this is a knowledge they cannot lose." NOTE [Author]

Medical knowledge was gained during the Tuskegee⁷ and Willowbrook⁸ experiments, and published in medical journals. The former generated data by deliberately not treating syphilitic patients and the latter by infecting patients with hepatitis. The experiments were unethical because, among other reasons, informed consent was not obtained from any of the participants. These and other incidents resulted in the Belmont Report⁹ which forcefully stated that there are self-evident constraints on the pursuit of medical knowledge.

Rogue individuals such as Dr. Josef Mengele did produce scientific knowledge by experimenting on concentration camp inmates.¹⁰ There is now a debate as to whether his research data may be cited in scientific articles. The consensus is that they should not. Was Dr. Mengele's research data forbidden knowledge? Rogue nations (allegedly Iraq) and scientists produce pathogens even though they also are condemned.

Are there some things man need not, or ought not, know or do? Super-pathogens and embryonic stem cell and cloning research will again give us an opportunity to address that question. Embryonic stem cell and cloning research is perhaps the more blatant example of the Frankenstein syndrome. There are compelling negative ethical reasons to prohibit proceeding: 1) the potential destruction of human life and, 2) the possible damage to the human germ cell line. There are also cogent positive reasons not to proceed. Alternative sources of stem cells—placental, bone marrow, circulating, and adipose, among others, are available and preliminary research has suggested that they may be as effective as embryonic stem cells. Cloning results in a high embryo loss rate and a disproportionate number of abnormal offspring. Would it not be un-reasonable to temporarily delay embryonic cell and cloning research? What if it is not necessary?

Conclusion

The current discussions regarding super-pathogenic germs and embryonic stem cell and cloning research force us to confront Dr. Frankenstein and potential constraints on the pursuit of unlimited human knowledge. There are limits. Ethical questions about super-pathogens and embryonic stem cell and cloning research should mandate prudence.

Will the Pelagian spirit of human perfectibility that permeates the Enlightenment mentality of modern culture override the call for deliberation? Oppenheimer's confession and the Belmont Report should support an acknowledgment of what John Paul II has characterized in *Fides et Ratio*¹¹ as "exceptionless norms." There are some things that should not be done. This however clashes with our cultural utilitarianism. If the murder of one innocent person will benefit two others, the modern zeitgeist will condone the

former We have a clash of two contradictory ethical systems regarding the pursuit of scientific knowledge

One would hope that the very brief horrifying one hour and 20 minutes, on the morning of September 11, 2001, that it took from impact to the collapse of the World Trade Center, a surrogate for our modern culture, should give us pause Can our technical accomplishments, at times, carry the seeds of their own destruction? We must ask is the attainment of human knowledge an end in itself or should it serve a higher purpose? In general, the record of human experience from Adam and Eve, Lot's wife, Pandora, Drs Faust and Frankenstein to Dachau and Hiroshima would suggest that humans will, given the choice, seek the forbidden fruit

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