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Embryonic Stem Cell Research, the Ethics, and the Alternatives

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Part I

Part II

1.1

Since World War II, countries started establishing strict laws against unethical research including that of embryonic stem cell research. Laws have been passed throughout the years by presidents in favor of and against embryonic stem cell research. On top of political figures, different religious and philosophical leaders have pushed on others their views about this specific type of research. In response to claims made about the ethicasy of embryo research, many legal and philosophical works have been written about what counts or constitutes the actual life of a human being, and whether this process starts at the time of conception, or weeks after the egg has been fertilized into an embryo; where science has made its claim from the benefits of prenatal diagnosis from in-vitro fertilization, the alternative arguments regarding abortion are long and highly sophisticated; the proposed alternatives to Embryonic Stem cell research as a whole hold promising results, but they have drawbacks of their own as well, and these are part of the reason why other countries outside of the U.S. are moving ahead in alternative forms of stem cell technologies. Embryonic stem cell research, as of now, is debatable, because one can not argue that the cons outweigh the pros, especially when the alternatives are starting to be understood as holding the true answers to cellular research in regards to various diseases and 'disorders' of the human body which we wish to cure.

When we look at scientific research as a whole, regulations against its practice began during world war two; one of the first prominent documents to bring about questions regarding the ethics of certain scientific experiments was The Nuremberg Code. Established in 1947, this document was the first line of defense

against unethical experiments first performed on human beings in Concentration Camps during the Second World War. At the time, a trial had been held by the American Military Tribunal; several German doctors had six points placed against them that defined legitimate research, and they had not followed a single one of these points in their studies on humans.

The six points were later turned into ten, but there was no way of enforcing them into American and International law all at once. Because of this, The Nuremberg Code never found its way into law past informing numerous international ethics statements (Jewish Museum 1). Laws changed with time as countries began to individually solidify what experiments they would and would not allow to be practiced within their own borders.

1.2

The reasons regulations were starting to break with this research was because doctors of all sorts were starting to see the benefits that could found from these studies. In the U.S. alone, regulations have changed with presidents from Clinton to Obama allowing different types of stem cell research to be practiced on a regular basis. One of the first documents in our country, which is still used today in putting regulations on funding for biomedical research, is the Dickey Amendment. This document was written by Representative Jay Dickey in 1996. It stated two key pertinent points to what funding should not be spent on: "The creation of a human embryos for research purposes, and research in which a human embryo is destroyed, discarded, or knowingly subjected to injury or death" (Kelly 115). This

all encompassing philosophy may have seemed sound in theory and in the American Capitol, but not when it came to the lab.

In 2001, George Bush decided to make federal funding available for certain lines of embryo-derived stem cells. CBS News noted Bush's critique on the matter, emphasizing, "He argued the he was defending human life because days-old embryos—although typically from fertility clinics and already destined for destruction—are destroyed to create the stem cell lines" (CBS News 1). On top of this, George Bush also created the Presidents Bioethics Council to review how embryonic stem cells were obtained since this topic was starting to become a large concern of the general public. (Kelly 116). Individual embryonic stem cells from their infancy were being looked at to see what benefit they could hold for the future, especially since their siblings were only destined for the dumpster no matter which way they were looked at.

Furthermore, at the end of president Barack Obama's first term, he signed an executive order that was part of a desire to find cures to certain cellular diseases through embryo research. An interview after the signing noted the following : "He said he came down on the side of the 'majority of Americans' who support increased federal funding for research, both because strict oversight would prevent problems and because of the great and lifesaving potential it holds" (CBS News 2). Also noted was a large pole taken of Americans' on this subject, writing, ". . .Sixty-five percent said they approved compared to twenty-five percent who disapproved" (4). This pole was taken in 2009, and since then, ratings have gone up within the general public being in favor of embryonic stem cell research.

I side with Bush and Obama to increase the amount of federal funds given to clinics for embryo research due to many reasons. Firstly, from a study done by Sharon Kirkey for a Post media news company in Canada involving the amount of embryos frozen in labs. According to her findings, "There are an estimated 4000 frozen human embryos in the U.S. alone" (Kirkey 2). Hundreds if not thousands of stem cell lines could be drawn for those organizations that receive insufficient funding to conduct their research, and this would only further studies to find cures for problems like Parkinson's disease and other illnesses—problems which scientist were trying to avoid through in-vitro testing of embryos in the first place.

Fertility Clinics across the country and around the world are already inclined to unfreeze frozen embryos after a certain amount of time. " [It is] ethically acceptable for clinics to deem embryos abandoned if at least five years have passed since contact with the couple has occurred, reasonable attempts have been made to reach them and no written instruction from the couple exist concerning how to dispose of their left over embryos" (Kirkey 1). Clinics are tearing at the seams with embryos, and after a certain amount of time they have no choice but to unfreeze them.

These clinics must be able to prove that they first tried contacting the couple in one form or another through phone, email, or letters; before disposal takes place; clinics today usually ask the couple what they want to happen to the embryos in a situation where death or incident may occur to one or both of the spouses involved (Kirkey 5). Past declaring the embryos abandoned for disposal, and after five years

of receiving no follow up from the parents, there has been no declared definition to what might satisfy a moral amount of time to wait to dispose of the embryos alone.

One might ask, "Why a parent would even 'abandon' an embryo, or why they might produce more eggs than they needed in the first place and then leave them behind?" The answer to this is that its part of the process with becoming pregnant. It takes on average more than one try to get such a difficult process to work for most clinics; the couple has the wife in these situations injected with more hormones to produce more eggs for fertilization; after the procedure has proved itself successful the embryos are frozen in case the parents ever wish to come back to try the procedure again (Kirkey 3). Again, quite sadly, a lot of those eggs which were frozen for couples are discarded due to abandonment; they are thrown into the biomedical waste bucket.

Even if cures to certain disease can be found through stem cell lines extracted from embryos, the problem would still go back and stand as to how one would ethically remove left over embryos that are frozen in labs. Bishops of the Catholic Church argue against their use for both research and disposal regardless. They argue against these ideas, stating, "Yet the argument that 'they are going to die anyway' is the same flawed excuse used by Nazi doctors to justify the torture and killing of countless innocent people in gruesome experiments during WW II" (Bishops 2). If this is to be to the fate of leftover embryos, by their opinion, then we have lost all rationality within the scrutiny of our own research—and I'll highlight more on their perspective and those of others regarding this research later on.

1.3

Currently in the U.S. today major laws have been put in place to protect the rights of individuals unborn. In a recent article put out by the Journal of Contemporary Health Law & Policy entitled Federal Funding of Human Embryonic Stem Cell Research, Contemporary Health L. and Pol'y stated, ". . .in at least twenty-five states, homicide laws 'protect prenatal human beings throughout or during some part of their gestational development" (Cont. Health L. and Pol'y 3). Life beginning at the time of fertilization is beginning to be enforced in states across the U.S.

But this is not just enforced because of a few petty cases involving the protection of human rights to those unborn. Just like Roe v. Wade, the major case that set the standards for unborn children was Webster v. Reproductive Health Services; in this case, "The Supreme Court recognized the right of Congress and the States to protect neonates against non-abortion related destruction, and to extend to them other benefits and rights under federal and state policy" (Cont. Health L. and Pol'y 3). Some may deem this to be quite a stretch but it does swing all the way to respecting the right of all American individuals, a point clearly stated in our founding documents

1.4

In general terms, the reasons why embryos and the stem cell lines that can be taken from them are so highly valued is because alternate forms of research lack characteristics of these cells. First, it does not take as long for these cells to grow and 'mature' within their own life span. Compared to other types of cells, they are able to grow at a faster rate. They are also able to multiply at a faster rate compared to that of pluripotent cells. Thirdly, in some instances there is a smaller chance that

the body will reject them as well(S.P. 2010). With clinics unfreezing and discarding embryos every day do to abandonment, it makes sense why scientists have pushed for these embryos to be set in part—literally—towards research, and this makes sense; it is the reason they were developed in the first place; to help individuals produce healthy offspring, not to be freely frozen and forgotten in a lab.

2.1

From a recent work posted in the Journal of Medicine and Philosophy, Erik Malmqvist wrote on Reproductive Choice, Enhancement, and the Moral Continuum Argument and how these ethical issues should be looked at moving into the future.

The first of three perspectives that Malmqvist points to is that involving therapy and enhancement in the future; who would be benefited from the therapy and enhancement. Malmqvist writes, "From the point of view of well-being, there can be no distinction between therapy and enhancement . . .insofar as enhancements can be expected to advance children's well-being and perspective, parents are morally obligated to pursue them"(Malmqvist 43). In situations where a couple might choose one egg over another for implantation, it would be the case that they take the healthy egg over the unhealthy one and the same philosophy could be applied in deciding to take one stem cell line from an embryo and putting it towards research rather than towards removal.

The second perspective involves new discoveries with genetics concerning intelligence, strength, and other valuable characteristics; despite the fact that these skills are being discovered from a biological standpoint they are shaped by more than just genes, and thus need to be looked at carefully. Malmqvist writes,"Traits

like self-control, intelligence, and physical strength are gradually shaped through complex social practices—rearing, education, training, and so on. If these aspects of science are taken lightly they could be viewed as having drastic affects which we don't know the full consequence of; they would also take away from such practices as child rearing along with the education system itself.

The third perspective is that with time it should be stated, or a difference should be made between seeking cures for diseases and genetic enhancement. Malmqvist argues, "One should want to make a fairly systematic—although not a categorical—moral difference between avoiding creating children with genetic diseases and seeking to create children with enhanced capacities. . .Concern for justice should make us want to make a fairly systematic moral difference between avoiding diseases and enhancing capacities" (Malmqvist 51). Additionaly, keeping the health care system equal to all with this type of work and not between that of the rich and the poor is a part of the question Malmqvist is trying to asks of his critics.

2.2

The reason such philosophies have been written is because of modern crimes within the realm of science. In 2006, over two thousand eggs were destroyed in Seoul; not a single stem cell line was developed even though they tried to clone the cells hundreds of times. Despite this tragic lose in the name of science there were three lessons that we learned from it.

First, that we must return to the drawing board. The Catholic Bishops Conference on this matter stated, "After eight years of effort around the world to

clone human embryos, no one has achieved even the first step in using this procedure for human treatments (so-called therapeutic cloning)" (Bishops 1)Scientist in Seoul were trying to clone embryos so they could be used on a greater scale for discovering cures, but if your taking the stem lines from the embryos—thousands of them—and your not getting any results in your lab, obviously there needs to be a reevaluation of your work.

The second lesson learned is that there should not be any more free rides for the cloning band-wagon. Bishops stated at the conference in 2006, "We need to ask cloning supporters to provide real evidence for their grandiose claims" (Bishops 3). Often in the U.S., questions and essays are asked of scientist before funding is given in regard to conclusions of what they plan to do with their studies and what they will produce

The third ethical conclusion learned from this is that the end does not justify the mean. This new ethic of 'the end justifies the means' has become a quick solution to the question with stem cells solving solutions with disease and stem cell research at hand. In an interview with Joseph Fletcher, the known father of situational ethics, "If the end doesn't justify the means, what does?" (Bishops 4). From this stems the idea that if no alternative can be found that some lines of stem cell research have inescapable consequences and risks involved.

3.1

A lot of argument has been made to the ethics surrounding this type of research and whether or not it should even be practiced at all in the first place.

A few specific points to address this problem have best been made in part by Thomas A. Shannon in Moral Issues and Christian responses. He writes in Chapter 13 on abortion stating, "First, few would dispute that the pre-implantation embryo is a living entity. It engages in cell division and metabolizes . . .Second this entity has the human genome. That is, it has a biological program from its DNA which ensures its development into a human being and not of a horse or a tree" (Shannon 375). He later continues on to state the opposite remarks of the argument, saying, "It is arguably not an individual, for example, until the process of 'restriction' is completed. After restriction at around two weeks, the capacity of the cells to become any body part is 'turned off' and the pre-implantation embryo becomes indivisible" (Shannon 375). Since his publishing, other works have also popped up over the years about what qualifies as a human or simply an embryo.

Furthering this argument, at the United States Conference of Bishops in 2011, Bishops noticed specific moral codes that were being crossed with current forms of embryonic stem cell research. They stated:

1. "that one may not commit evil acts to achieve even a worthy goal"
2. "that the powerful in society have a duty to protect the weak";
3. "that there are moral limits to what science and government can demand regarding voiceless, helpless human lives being used for the benefit of others" (Bishops 1).

If scientists and the scientific community at large do not involve ethical ways to cure diseases then they may be destroying the basic fabric and ways of human life that they so greatly wish to preserve and help in the first place.

4.1

When looking at all these arguments put out by Bishops of the Church, Scientists, and Philosophers, they all make one ask whether a clear line has been drawn as to what exactly counts as a Human Being. There have been lines drawn as to define a human being, and an embryo, but there have been many other perspectives including that of ensoulment, when life fully begins, and the many arguments behind when a person is fully considered an independent entity.

The first of seven definitions in drawing lines between a human and embryo is written by Bishop Sameul J. Aquila in *The Sanctity of Human Life from conception to Natural Death* specify important human issues that have been misinterpreted through history; the first is that of individuals misunderstanding the definition of the human person. Aquila writes, "The right to life and human dignity is not dependent on the person's autonomy and ability to live independently. A state does not have the right to decide who has dignity and who does not" (p 4). It is not up to some individuals to pass judgment on others regardless of their differences, whether outwardly or inwardly.

Another note by Aquila with this research is in the concept or idea of god; without it, Aquila believes that there is no hope for humanity. Aquila boldly states, "'Without the creator the creature would disappear . . .But when God is forgotten the creature grows unintelligible"(EV 22 and GS 36) "Life itself becomes a mere 'thing,' which man claims as his exclusive property, completely subject to his control and manipulation"" (EV 22) (p 4). If science is to be guided in the right direction the

hope is that is has the compass or leader to guide it in the right direction, and this should always be the hope of where research is going in the future.

There is also the argument of a pre-embryo and where this fall in line with defining an individual. After the sperm has fertilized the egg it then begins moving towards the uterus or uterine wall undergoing chemical changes as it develops into an embryo. As it approaches the Uterine Wall it becomes a Morula in its twelve to sixteen cell stage; around the sixth or seventh day, the organism now called a blastocyst, begin its implantation against the uterine wall and when development begins there. In terms of molecular biology, it is not until the third week of implantation that the morula is defined as an embryo (Shannon, Wolter 607, 608). This entire development brings in entirely new arguments towards defining what counts as an individual and what counts as individualized cells which can be used for research.

What counts as a human being has been labeled in part by Thomas A. Shannon and Allan B. Wolter as a four fold definition: That it begins at conception, that it begins with being questioned and with a response, not by singleness but ensoulment, and finally ending with physical individuality? With conception being the first of the four, Shannon and Wolter state, ". . .conception occurs only after a lengthy process has been completed and is more closely identified with implantation than fertilization (Shannon, Wolter 611). They argue that the moment the egg is implanted with the sperm that life has begun and that it is sacred and cannot be indivisibly developed further towards other means.

The reason why singleness is also not applied to implantation is because the zygote can still go through twinning, fission, or breaking into any further potency of any cell of the developed embryo, Shannon and Wolter write, "The zygote gives rise to

further divisions 'resulting in an aggregate of cells', each of which remains equivalent to a zygote in the sense that it can become all or any part of an embryo. . .such cells at this stage are totipotent" (Shannon, Wolter 612). It is only until the egg has been implanted and its development has been restricted to developing into one organism and one type of organism alone.

The second part of the definition, Ensoulment, has come to be recognized by two parts: mediate and immediate animation. Mediate animation as defined by Shannon and Wolter is, ". . .impossible so long as the parts of the brain which are the seat of the imagination and the vis cogitiva (and we might add, the memory) are not suitably organized" (Shannon, Wolter 617). In a way, the ability of the mind to create memories is necessary.

Immediate animation on the other hands occurs upon the fusion of the egg and sperm (Shannon, Wolter 618). This distinction was made as it was uncertain whether the entity being produced would develop into the embryo stage or not.

The final part of defining a human being, biologically speaking, is where the definition of a human being becomes scattered or difficult to follow. At present, the following three ideas have been thought up for what counts as an individual from a biological perspective:

1. "With the analysis of Ford, given the biological evidence, that there is no known reason why the fertilized egg can be considered a [human being] minimally until after implantation. . .thus the range of time for the achievement of physical individuality is between one and three weeks of embryonic development.

2. Ford also suggests, “the formation of the primitive streak, which coincides with the time of the formation of the neural tube, as an appropriate criterion”.
3. The biological data suggest that the minimal time of the presence of a rational nature would be around the 20th week when neutral integration of the entire organism has been established” (Shannon, Wolter 620).

The complex definition of the physical individual is what helps to finalize defining a fully developed individual, and it is not so cut and dry as one may have assumed it to be.

In the Donum Vitae published in 1987, *Respect For Human Life in its Origin,* many Episcopates created this document in re-instating important aspects of value to human life. In part of it regarding embryos, Bishops of the church wrote, “’From the time that the ovum is fertilized, a new life is begun which is neither that of the father nor of the mother; it is rather the life of a new human being with its own growth. It would never be made human if it were not human already” (Bishops 5). From their perspective, this is the primary reason against devaluing embryos in that they themselves are newborn individuals waiting to fully develop from their beginnings as fertilized eggs.

From this, the Bishops go on to state that these individuals have rights and that these rights should be upheld. They state, “. . .since the embryo must be treated as a person, it must also be defended in its integrity, tended and cared for, to the extent possible, in the same way as any other human being as far as medical assistance is concerned” (Bishops 6). They reinforce again that fertilized eggs that

are destined to be placed back into a women are to be considered as individuals and to be respected.

Lastly, Kristina Hug wrote a paper called *Therapeutic Perspective Versus The Moral Status Of A Human Embryo*, she states the arguments for and against the status of an embryo in the fullest of measures. First and foremost, She argues, "A human embryo is a human being in the embryonic stage, just as an infant or an adolescent is a human being in the infant or adolescent stage of its life" (Hug 2). An embryo is still a person despite the fact that it is simply in a different stage of development, and therefore it should be respected.

The counterargument to this made by Hug was that embryos do not have any accountable amount of characteristics necessary to prove themselves as human beings She argues, ". . .early pre-implantation stage embryo do not have the psychological, physiological, emotional or intellectual properties that we associate with personhood" (Hug 2). How are we to judge these individuals if they are unable to judge us or even themselves.

The question posed by Hug is if it is possible for one to judge the moral status of a pre-embryo as growing with time just like that of an embryo itself? She responds by stating, "The main point of the gradual view is that the moral status and the protection of the embryo should increase as the fertilized egg becomes more human-like" (Hug 3). Simply put, one might argue that respect comes with age, and therefore there might not be any reason to delay the start of this respect from the embryonic stage of development or even before.

The counter argument to this is that only until the eggs have reached a certain stage of development upon implantation can they be given a certain level of respect. She writes, "Until the second week of implantation, the embryo is still relying on transcription factors from the mother, and therefore not fully 'defined'" (Hug 3). If the egg is still reliant and unable to grow until two weeks into implantation, it might be argued that the embryo isn't fully a human or even yet on the individual journey to becoming a developed human being until the second week of development.

The third argument that Kristina Hug brings is what if the embryos are seen as having no moral status at all, but rather as just organic material. She nobly and truthfully writes, accordingly, they have no independent moral status at all, and are merely the property of the people from whose body they came (Hug 3). Despite the fact that the embryo has all the cells to become a person, it is still dependent biologically, and therefore morally, dependent upon the mother until development has fully occurred and is not to be considered as an individual.

The counterargument to this point raised, however, is that the embryo is taken away from what it could have fully developed into. Hug refutes against the point made saying, "By directing an embryo to 'become certain cells', the embryo is prevented from developing its normal complete fashion" (Hug 3). In not giving the embryo some sort of status and moving forward with stem cell research the embryo is fully prevented and unprotected from becoming its destined fait, a human.

Even if the embryos are not able to grow into full adult human beings, some of them have been considered for fetal tissue transplantation, thus proving their 'worthiness' to be considered human beings. Thomas Shannon argues, ". . .practices such as fetal

tissue transplantation, the pre-implantation embryo or fetus is not experienced as having some value in itself but as valuable because it is useful". Marginalizing ones worth as an embryo proves scientific research to be unsatisfactory in such areas of moral development.

5.1

The most recent research involving embryos has all been forwarded to prenatal testing and the benefits that flow from it along with opposing arguments relation to abortion

To give an overview of the general technology, it is mainly an issue of how it can be used and questions with where we are going with it in the near future. It has been found to be quickest and most effective way to look at specific types of disorders while avoiding abortion. It does however make one ask how genetic manipulation can go in the future with larger and larger technologies. Thirdly, as broad as the question may be, there is no answer as to how it will effect the human genome; of the 400 genetic disorders currently known many of them can be pre-screened through this technology.

Despite the fact that there are many uses and benefits to this technology, there are also many pitfalls. The first problem that has occurred is its problem in price; according to findings done by Bonnie Steinbock, John D. Arras and Alex John London, the current procedure at minimum cost 15,000 dollars to do at fertility clinics (Arras, Steinbock, London 514). The sad truth in part about this technology also, is that not even all the eggs are used, and therefore not all the money is used within the procedure.

The second problem that has arisen is in people wondering about screening and looking for advanced characteristics, or eugenics. People simply wondered if society, or the richer within it, were headed for a world in which those with money would test characteristics such as being tall, or being smart as possibilities (Arras, Steinbock, London 515). This will be high lighted on later, however, this type of genetic testing and feasibility is something that will not be fully possible, not even in the near future.

Access to these types of technologies in the future also put a burden on parents who do not act in such situations where genetic disease is possible. If parents don't treat the child it deprives them of the right to an open or equal future as the other individuals being born (Arras, Steinbock, London 516).. The counter argument to this might be that a parent would have to state they wanted the child just as beautiful as the were being naturally born because I believed that you could do anything that any other child might be able to do, but in some instances this argument falls below certain standards.

There are also determining factors that over arc whether procedures like these will stand in the future. Factors like:

1. Number of people interested.
2. Those interested who avoid abortion.
3. The proportion of those reluctant to consider about who would be willing to meet the monetary and nonmonetary costs of PGD (Arras, Steinbock, London 517).

Deciding factors like these obviously play out in the boutique society alone.

There are three factors also to consider when looking at what the procedure will and will not solve. The procedure:

1.Will not solve genetic disorders only screening despite the fact that it is able to find healthy eggs among the many being produced.

2. Is simply to provide information about the pregnancy

3. It provides the couple with prenatal information that prepares them for the birth of their child (Arras, Steinbock, London 518).

Even though it would be beneficial to save a pregnancy from ever occurring that was not desired, this still technologically is still destroying the embryo, despite the fact that its outside of the woman.

When Bishops look at Pre-natal Diagnosis it is only considered beneficial under certain considerations. The Bishops believe, "The methods employed should safeguard the life and integrity of the embryo and the mother, without subjecting them to disproportionate risks" (Bishops 6). If the safety of the mother or child soon to be is jeopardized, than obviously there is a problem with how the procedure is being done; however, if this is not case with the technology being used with the pregnancy, then there is no reason why the pre-natal diagnosis should not be used in the first place.

When pregnancies are looked at for whether they will be desired in the long run or not, there is a lot to be said involving pre-natal diagnosis and in-vitro fertilization. Thomas Shannon notes, "If a pregnancy is recommended, it is clear that it is essentially a desired pregnancy, or at least has not been rejected by means of abortion" (373). The perspective on whether the child has a value to life is being

looked at and negotiated in this instance, and in these situations further investigation needs to be taken place, less the child is to be born with some incurable disease; and especially in such instances where cures are available. By science, this also then in turn the fetuses status into that of a patient

However, there is no exception in not giving birth to a child due to genetic defects. According to the Episcopates on this matter, ". . .eliminating fetuses which are affected by malformations or which are carriers of hereditary illness, is to be condemned as a violation of the unborn child's right to life and as an abuse of the prior rights and duties of the spouses" (Bishops 6). Only scientific means of intervention and research that heal or improve the life of the individual are seen as beneficial.

5.2

This was one of the main questions in discovering the technology and wondering whether it would meet ethical requirements in the church. Accordingly the argument is, "[That] you are destroying an embryo vs. a fetus, however, under the churches moral rule, prenatal life post-fertilization is of full and equal moral status to that of all other persons; no distinction exists between discarding an embryo and aborting a fetus"(Arras, Steinbock, London 514). This type of technology does not bypass killing an embryo, even if its out of the mother's womb.

Before looking at the alternatives to embryology research along with moving past the negative side affects from prenatal testing it is important to quickly understand the negative pitfalls in abortion that might sway one to believe that prenatal testing and embryology are alright. Up to this point in time women are looked at as not having equal rights with men and something is to be said about this

in line with prenatal testing. Patricia Beattie Jung and L. Shannon Jung retort in Moral Issues and Christian Responses, "Those who proclaim that a zygote at the moment of conception is a person worthy of citizenship continue to deny full social and political rights to women" (Jung 365). This is a true question as to how much we honor a new born child over the woman who is now at the mercy of child rearing and all the complications that come with it.

A second point made is about the value to human life argument and whether it is necessarily weighted honestly. Men go out into the battlefield or in some forms of their jobs to deal with extreme hazardous chemical war, yet there is an even larger or equal harm in harming prenatal life which hasn't even been fully discovered yet? (Jung 365). When the child is at the mercy of a pregnant teenage mother, as most abortions are, the question of whether aborting or looking upon other forms of harmful abuse to embryos and future cures through prenatal testing are questioned.

6.1

In 2005, Clive Cookson published two alternatives to embryo research and both hoped to avoid ethical concerns all together. In the London Financial times he wrote, ". . .they removed a single cell from a newly fertilized mouse embryo and grew embryonic stem cells from it" (Cookson 1). This, again, is what scientist today; the take one cell and the rest will grow back in the original eight-cell embryo. He also stated, "The theory is that scientists will extract stem cells from embryos, and genetically alter them to make them impossible to implant in the uterus, thus impossible to be humans (Cookson 1).

6.2

In the 18th International Congress of the Transplantation Society, John Paul the Second stated that the alternatives to embryo research alone should be looked at and that no embryonic research should be followed through with in the future. He stated at the conference, "Science itself points to other forms of therapeutic intervention which would not involve cloning or the use of embryonic stem cells, but rather would make use of stem cells taken from adults" (Paul 4). Paul was right when he said that the alternatives were where this type of research was being further looked into—but not that we would fully discard frozen embryos and claim it ethical over putting them towards research.

The more prominent alternatives that have been made into functioning alternatives involve stem cells and techniques with gene therapy. Looking at stem cells first, according to the Declaration on the Production and the Scientific and Therapeutic use of Human Embryonic Stem Cells,

> ". . .A commonly accepted definition of a stem cell describes it as a cell with two characteristics: 1) the property of an unlimited self-maintenance – that is, the ability to reproduce itself over a long period of time without becoming differentiated; and 2) the capability to produce non-permanent progenitor cell with limited capacity for proliferation, from which derive a variety of lineages of highly differentiated cells" (p 1).

Stem cells first came out with varied definitions when first discovered, but currently as they are used this is the main defining characteristics of them.

However, procedures today make use of adult stem cells that are given transcription factors to help them 'morph' back into multipotent cells. Originally this

practice of injecting stem cells alone into certain parts of the body yield all different types of teratomas or cancers from their proliferation. Thomas Gale stated in Stem Cells, Opposing Viewpoints, "An adult stem cell is an undifferentiated cell found among differentiated cells in a tissue or organ, can renew itself, and can differentiate to yield the major specialized cell types of the tissue or organ. . .Some scientist now use the term somatic stem cell instead of adult stem cell" (Gale 192). These highly specified cells are again adult stem cells found in ones own body that are directed to prepare broken tissue if it is torn a part.

6.3

Today there has been found four potential types of genetic engineering, but not all of them have been practiced yet; Somatic Cell Gene Therapy, Germ Line Therapy, Enhancement Genetic Engineering, Eugenic Genetic Engineering. Somatic Cell Gene Therapy being the first of the four types, has some interesting characteristics about it, yet runs some ethical complications, much like the others.

Somatic Cell Gene therapy is the fixing of a genetic defect or cell transplantation into another individual due to their cells having a genetic defect. According to W. French Anderson in his section Human Gene Therapy: Scientific and Ethical Considerations, "At present, the only human tissue that can be used effectively for gene transfer is bone marrow" (Anderson 278). This is the one type of cell transfer that is used on a large scale commercially that has been proven to hold no minimal defects as of now, but that's because its science is being understood and tested quite quickly.

The second line of therapy is Germ line Therapy. Gale states, "Germ Line Therapy: require[s] the insertion of the gene into the reproductive tissue of the patient in such a way that the disorder in his or her offspring would also be corrected" (Anderson 1). While this type of technology sounds like a very beneficial aspect of genetic research it has many problems.

Even though this Germ line therapy is effective it can not be produced on a large scale and it is very costly. According to Anderson, "Microinjection into tissue culture cells has been used for a number of years and has the advantage of high efficiency (up to one cell in five injected can be permanently transfected). However, the distinct disadvantage is that only one cell at a time can be inject. Transfection of a large number of cells (like 10^6) is not possible" (Anderson 283). Such situations would make it difficult when you would like to inject germ line cells which affect the growth of organs in adults; the cells would not proliferate at a fast enough rate.

In looking at how you inject the genes lies the problem of what exactly will happen to the cells. According to Anderson, "microinjection of eggs can produce deleterious results because there is no control over where the injected DNA will completely integrate into the genome" (p 284). With this in mind it makes it very difficult to find out exactly how to practice this type of genetic manipulation, let alone commercialize it after enough successful trials have been performed.

Thus far, three principle guidelines need be followed on a more rudimentary level before these types of genetic manipulation can be carried out on a larger scale. The Three factors are:

1. “[that] there has not been enough studies that establish the effectiveness and safety of treatment of somatic cells;” (Anderson 214).

2. “there should be adequate animal studies that establish the reproducibility, reliability, and safety of germ line therapy, using the same vectors and procedures that would be used in humans;” (Anderson 234).

3. “there should be public awareness and approval of the procedure;” (Anderson 276).

When an individuals funds and overall health are at stake, there simply can be no progress forward with these advanced forms of technology regulations and guidelines being followed.

The third type of genetic manipulation, Enhancement Genetic Engineering, is yet another reasonable procedure that also lacks complete reliance and confidence in practice. “. . .this would involve the insertion of a gene to try to ‘enhance a known characteristic; for example the ‘simple’ practice of placing an additional growth hormone gene into a normal child” (Anderson 1). Despite being a costly procedure it is begging to enter into a realm of genetics which is highly sophisticated and unstudied.

6.4

The problem with this type of research is that is lacks definition with how the human body might to respond to such a change. Anderson states, “to insert a gene in the hope of improving or selectively altering a characteristic might endanger the overall metabolic balance of the individual cells as well as that of the entire body. . . .the body as a whole cruelly monitors and balances a multitude of physiological

systems" (p 287). These types of genetic manipulation would obviously be put through rigorous levels of testing and trails, but the only way to ever know how these types of tests work is through trials on humans and this where the rigor of the tests comes into; one honestly does not know the full weight of the science that they are doing until it has proven itself time and time again. The last paragraph of this section explains the problem with this research.

Eugenic Genetic Engineering is the fourth type of genetic engineering that is highly sophisticated. This is defined as the attempt to alter or 'improve' complex human traits, each of which is coded by a large number of genes; for example personality, intelligence character, formation of body organs, and so on" (p 1). While some scientist may argue that if we can fix down syndrome through genetics why not take it a step further and make ourselves intelligent; this however moves in ways of genetics that we simply do not understand as stated by the moral continuum argument, and we may not understand them for a very long.

Like Embryonic Stem Cell research, Gene therapy has also been successful in producing medical results. In a recent study in Panama Scientist Neil Riordan and his colleagues found remarkable cures working with stem cells. They stated in a recent paper of Stem Cell Therapy and Spinal Chord Injury, "A number of published papers and case studies support the feasibility of treating spinal cord injury with allogeneic human umbilical cord tissue-derived stem cells and autologous bone marrow-derived stem cells" (Riordan 1). These trials worked in not only spinal patients, but also with patients dealing with heart complications, bone abnormalities, and other varying disabilities.

Panama is not the only country to do this type of research; it is occurring and being produced around the world in many nations. In Jordan and America as well, there have been labs created that are also highly sophisticated with the research that they do and the amount of studies that they produce.

In a recent study by scientist at the National Institute of Health in the U.S., scientists reprogrammed T-Cells in the immune system to be able to combat H.I.V. Doctor Ian Sample at the research stated that they were able to inject specific genetic proteins into the wall of the cell which lead to development of specific receptors which enabled the cell to bind to infected cells contain H.I.V. (Ian 4). While this these types of trials are a long way from being developed past the clinical level, they show where scientists are currently at within the levels of their current research.

6.5

While stem cell technologies are largely beneficial many problems are standing in their way besides finding ways of trying to inject them in order for them work most efficiently. “Generating several IPSC lines take about six months, compared with 18 months to obtain one ESC line, said Mahendra Rao, vice president of stem cells at Life Technologies, a biotechnology tools company” (Alzoform 2). Besides this, companies have also run into the problem of individuals bodies rejecting stem cells in various ways. Companies have gone about solving this dilemma in the following way stating, “Many institutions try to gather control lines from a patient’s relatives, to minimize the effect of the genetic background” (4). Generalizing the material, their bodies are rejecting the stem cell lines and different

methods are being experimented with to suppress one's immune system from attacking the alien cells or what the body perceives to be foreign.

Gene therapies have all sort of complex dilemmas that hinder their evolutionary growth within the market. The fact that you are not able to control which cells will and will not be infected with genetic proteins halts the market all together. That along with some of the varying expenditures, and public opinions are just a few of the many reasons genetic technologies are not in production.

Lastly, the largest problem in these two alternatives along with embryo technology itself is involving death. On april 6, 2014 of this year two patients of John Carroll's at the National Institute of Health died in a clinical trial testing the development of T-Cell development in a cancer study (Carroll 2). Many if not hundreds of trials have to be done in a dish, on a mouse, and beyond before these technologies are approved on humans, and even then it's a slow and tedious process to make great steps to securing a cure; the science must prove itself safe.

7.1

Other countries don't have as many regulations in line as in America by the F.D.A. on these scientific studies; other countries push forward in making greater advance in stem cells realm of science. Stem Cell research in second world countries is brought to them by richer organizations that have the money to set up these technologies, and since there is not as much regulation, research moves forward (Kelly 124). This is part of the reason why other countries are going to stride ahead of the U.S. within the near future with these technologies, but at the risk of its citizens not willing to ask how the technology got to a second or third world country

in the first place—from an American standpoint, health care might have been a fourth right included in John Locke's idea of what a government should support for its people because currently American's are going elsewhere for part of it with gene therapy.

7.2

This ethical situation that we have fond ourselves in when dealing with stem cells and embryos is one that comes with many complex questions. We must realize that there cannot be one solution to this problem; we must break it down into its complex parts and set more regulations for what counts as right and wrong within the realm of stem cell research. I believe that embryo research should be followed through with, especially when taking one cell from the initial egg will not kill the embryos abandoned at fertility clinics. I also agree that alternatives can further be developed through stem cell and genetic research in order to hinder all forms of embryonic intervention. Hopefully the U.S. continues to voice its opinion with these new technologies less we allow others to surpass us with its real and growing potential within the medical field.

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