

# When Does Life Begin?

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# When Does Life Begin?

**Abstract:** Embryonic stem cell research is a controversial topic that involves delving into the belief systems of religion. Judaism and Catholicism will be studied and the concept of when life begins will be discussed. Relevant to this research is the foundation for the decisions made by officials within the respective religions. It will show that the reasoning behind the debate of embryonic stem cell research has more to do with abortion than anything else. The Catholics combine the issues of abortion and embryonic stem cell research, while the Jews separate the two issues. The purpose of the paper is to explore the ideas of each religion and understand the interpretations made.

This paper will take a look at the religious view points from those involved in the Catholic and Jewish religions. Specifically, those persons that make important decisions pertaining to the determined translations and the use of scripture from their religious texts to support their respective viewpoints on embryonic stem cell research. The two will then be compared and contrasted in an attempt to understand the

difference in the interpretations of the same scripture from the same source. Evidence will be used to support each specific religion's belief system and how it relates back to the other religion's belief system.

The exposure of the basis of the interpretations will be found to relate back to the topic of abortion. The reasoning will become clear about what passages are found to provide evidence for a certain belief of a specific religion, and how those passages are translated and interpreted for the common folk.

Embryonic stem cell research is a topic that has led to quite some controversy, especially in the last decade. This is due in large part to the religious influences that play a significant role in politics and government. Many religions like to compare the use of embryonic stem cells for research to that of aborting a fetus. However, the real discussion relies on the debate of when life begins. Does life begin with implantation in the womb, at conception, or simply fertilization of a female egg with sperm? An interesting concept to look at when dealing with multiple religions is why one interprets scripture from the Bible a certain way, and why another interprets the same scripture to have different meaning and significance. The causes in the differences of the translations of these texts need to be examined to fully understand why each religion believes, preaches, and practices the things that they do. Also, relevant and pertinent to the topic is the investigating of who the officials are in the religions that are making these translations and interpretations. Where do they get their opinions and interpretations on the scripture from?

Stem cells are cells that have a potential to develop into many different types of cells in the body. They can act as a repair system for the body and are able to replicate (or divide) for as long as that body is alive. Stem cells can divide and transform into another type of cell with a different sort of specialized function. They have the ability to become a muscle cell, a red blood cell, or a brain cell. Embryonic stem cells are used as they divide more easily and are easier to work with. Stem cells come from the umbilical cord as well as embryos. These cells are said to have the potential of finding cures for such diseases such as Parkinson's and also spinal cord injuries.

## **Catholicism**

Catholicism is a religion that has not changed much over the years nor throughout the centuries in terms of a belief system. The topic of conception and when life really begins has only come about in the last forty years or so due to such controversial topics as abortion and embryonic stem cell research. Catholics claim that they base their feelings of anti-abortion and anti-embryonic stem cell research from the words of God throughout the Bible. The heads of the Catholic Church, the Pope and his archbishops, also refer to the bible when they speak of the need to do away with abortion and embryonic stem cell research. To them the issue is about what is morally and ethically acceptable and unacceptable in God's eyes. A viable life is constituted as conception, and that immediately following the fertilization of an egg, life has begun. As Pope John Paul II said, "Human stem cell cloning is morally unacceptable. Every

medical procedure performed on the human person is subject to limits: not just the limits of what is technically possible, but also limits determined by respect for human nature itself. What is technically possible, is not for that reason alone morally admissible” (Wahrman 57).

It seems that most people, religious or not, would come to the conclusion that research that could help future sufferers of diseases and even help find cures is a good thing. It is not the use of stem cells in itself that is causing the medical ethical dilemma; it is in fact the use of the embryo for stem cells that is the issue. Although proven to be more beneficial scientifically, embryonic stem cell research has taken a backseat to adult stem cell research and umbilical stem cell research in order to coincide with religious beliefs. In fact, the Catholic Church specifically endorses stem cell research in the areas of using adult stem cells and umbilical cord stem cell research (Richert). Their only issue with stem cells comes from the use of embryonic stem cells. This topic has to do with using a “potential” human being for research that causes later destruction of this “potential” human being. In order to realize what makes an embryo a “potential” for life requires looking into the background of religion to find out when actual life begins and the factors surrounding this.

To believe that everything and everyone is created by God, one could believe that because of this, abortion and stem cell research are morally wrong as they do away with something that God has created. Acts 17:25-29 in the Bible reads

"...He gives to all life, breath and all things. And He has made from one blood every nation of men to dwell on all the face of the earth, and has determined their preappointed times and the boundaries of their habitation, so that they should seek the Lord, in the hope that they might grope for Him and find Him, though He is not far from each one of us; for in Him we live and move and have our being, as also some of your own poets have said, 'For we are also His offspring.' Therefore, since we are the offspring of God, we ought not to think that the Divine Nature is like gold or silver or stone, something shaped by art and man's devising..."

These series of quotes taken from the Bible about life and the purpose that God has in creating life, lead to the interpretation that the Catholics make about embryonic stem cell research and abortion. Archbishop Raymond Burke believes that "It is critical that we as Catholics, true to the teaching of the natural moral law, oppose the initiative [of embryonic stem cell research] because it seeks to make legal the taking of human life" (Castillo III). This is taken in context that life is something that is predestined and predetermined by God. That destiny and fate of a viable life should not be used for any sort of experimentation that causes the expiration of this life. If one were to believe that all life is constructed with a specific purpose and reason, than the belief system of the Catholics would hold to be true. Further discussion reveals that sees that embryos are human beings. The embryos need to be killed for this type of research. Some

scientists want to create embryos only for the purpose of experimentation. Basically, using live human beings and killing them for science” ( Peters 35).

In Deuteronomy 30:19, God says,

"I call heaven and earth as witnesses today against you, that I have set before you life and death, blessing and cursing; therefore choose life, that both you and your descendants may live..."

This excerpt talks about the importance or emphasis God makes on choosing life over death. This can be related back to the topic of killing embryos. Surely God would choose to let those embryos live as to Him life is what is important. Isaiah 66:9 refers to this as it says:

“Shall I bring to the time of birth, and not cause delivery?” says the Lord. "Shall I who cause delivery shut up the womb?" says your God.

The purpose of referencing this scripture is in that it refers back to the fact that God is the ruler of all, and be the only one to allow or not allow a child to be delivered from the womb. The Catholics refer to this verse in the bible to back up their beliefs surrounding that man is not the judge of who lives or dies, and that the only real judge is God. This belief system appears to justify that embryonic stem cell research is wrong as the embryo is not even given a chance to be delivered and live past conception.

The Catholic Church uses its interpretations of the Bible surrounding abortion and applies them to the topic of embryonic stem cell research. To them, it is the same issue as life is not allowed to succeed in either case. To the Catholics, God views life



as a fetus in the womb as equal to a human life outside the womb. Therefore, destruction of a fertilized egg in the womb constitutes murder in the eyes of God as a fertilized egg has as much human life value as does an actual human being. This can be seen in Exodus 21:22-25 where it states:

"If men who are fighting hit a pregnant woman and she gives birth prematurely but there is no serious injury, the offender must be fined whatever the woman's husband demands and the court allows. But if there is serious injury, you are to take life for life, eye for eye, tooth for tooth, hand for hand, foot for foot, burn for burn, wound for wound, bruise for bruise."

This makes no reference to what value life has in a petri dish. Is a fertilized egg really considered life if it is fertilized and not implanted in a womb? Although unclear to the exact interpretations of this kind of science, many Catholics can use the references in the Bible such as the one above to make a clear cut case against such research. One reference that God does make in the Bible about conception can be seen in Jeremiah 1:5

"Before I formed you in the womb I knew you, before you were born I set you apart."

These words are very strong words in support of the Catholics belief surrounding conception and the value of human life. This can be related back to the fact that God

has a plan for all and once conception takes place, that plan is set in motion. According to this scripture, life once conceived inside the womb or outside the womb has purpose and meaning. Catholics tend to take old, traditional lines of scripture from the Bible and apply them to new science and technology. Referring back to the previously stated scripture one can easily see how this verse would back up the Catholics belief on abortion and embryonic stem cell research in view of the rights of a being.

The theological anthropological debate relies in the issue of whether or not the fertilized egg has the right for “potential” of life at conception. Roman Catholic theologians believe that dignity of life occurs according to nature within a mother’s body with the mother’s egg, the father’s sperm, and God’s newly created soul. This can be seen in Psalm 139:13-16

“For you created my inmost being; you knit me together in my mother’s womb. I praise you because I am fearfully and wonderfully made; your works are wonderful, I know that full well. My frame was not hidden from you when I was made in the secret place. When I was woven together in the depths of the earth, your eyes saw my unformed body. All the days ordained for me were written in your book before one of them came to be.”

According to the late Pope John Paul II “when the sperm and egg unite to create a unique genome, then God creates an immortal spiritual soul and imparts it to the conceptus. Once the early embryo has its immortal soul, it then gains dignity. With dignity, we must protect it from destruction by medical scientists, even when it appears

outside the mother's body in a laboratory setting." (Peters 31). The Vatican claims that ensoulment happens at conception and that it cannot be distinguished from science. They also believe that ensoulment is metaphysical, and not physical, and is within the realms of philosophy and not science. So if ensoulment is given at conception, the act of embryonic stem cell research would then be wrong is one of the claims of the Vatican Church.

The Catholic Religion has a belief system built on old, traditional values that continue to rule and shape the way that decisions are made about issues such as science and technology. Many of these values come from the Bible and are interpreted in such a way as to provide support for the opinions and decisions made by the Vatican Church, and specifically by the Pope. The Catholic Church justifies rejecting the notion of embryonic stem cell research in relating it back to the controversial topic of abortion. In their eyes, the killing of a potential being is the same whether or not it is in the womb of a woman, or outside of the womb. This allows them to make the connection between what God claims about the importance of life and giving birth to life in the bible, and their beliefs about the unethical use of embryonic stem cells. The interpretations of the Bible by Catholics are the same more or less across the board. The use of scripture helps promote the belief system set in place and influences the thoughts and opinions of current Catholics. The bottom line is that according to the Catholic faith, embryonic stem cell research is wrong and immoral as it involves the destruction of a "potential" being. And that "potential" being has as much rights as an actual living, post-birth human being.

## Judaism

Judaism is a religion that supports scientific development as it relates back to the preservation of life. Jews believe that science is necessary and a fundamental part of life in order to promote the solution to many current diseases and illnesses that plague the human population. That being said, it is no wonder that Jews support stem cell research as well as embryonic stem cell research.

The Jewish community opposes abortion, perhaps not as much as the Catholics, more so on a sort of neutral stance towards the issue. However, they have a different opinion about the topic of embryonic stem cell research. This is due in large part to the view they have of when life begins and what constitutes a viable life. According to Rabbi Yoel Jakobovits,

“An early fetus is only water for the first 40 days of gestation. While it is mere water, if it has been implanted into the uterine wall it may not be aborted for retrieving stem cell tissue, even if that reason is to save another life. On the other hand, embryos that have not reached the uterine wall, meaning embryos in a petri dish or those left aside during in vitro fertilization cannot develop into viable fetuses. Consequently, there would be no Jewish legal opposition to disposing of them, conducting research on them, or deriving stem cell tissue from them”

(Castillo III). Assuming that what Yoel refers to is a shared belief amongst Jews, it would seem that Jews do not mind “playing God” when it comes to decisions about life

and medicinal practices. They believe that it is imperative to do everything possible to repair medical defects in a viable life.

The concept of when life actually begins is a valid point when looking to whether or not a fetus has value and to what extent that value is. According to Jewish law and the Talmud, the “act of birth changes the status of the fetus from a nonperson to a person” ([www.myjewishlearning.com](http://www.myjewishlearning.com)). Furthermore, the Talmud states that, “if the greater part was already born, one may not touch it, for one may not set aside one person’s life for that of another” ([www.myjewishlearning.com](http://www.myjewishlearning.com)). This gives further evidence that the Jews believe that once a fetus is born, humanhood has begun and that fetus is considered a person with intrinsic value equal to that of any other person. The only time that the Jews consider aborting a fetus permissible or allowable is when the fetus interferes with the mother’s life. In other words, it is clear that the mother’s life has more value in the Jewish community than that of the unborn child.

The belief about the fetus only being water for the first 40 days of gestation is a concept considered to be a foundation for the Jewish community. This belief stems from the fact that “prior to 40 days, a mis-carried fetus does not trigger birth-related purity issues, and therefore is of a lesser status than a more mature fetus” (Castillo III). There are many rabbinical references and writings about this 40 day gestational period of life. However, according to the Jewish faith, abortion is not legal or morally acceptable even when during this 40 day gestational period. There is a fine line on when embryonic stem cells can be used and when they cannot. It is evident that any

implantation that has occurred of a fertilized egg in a womb constitutes passing a point where destruction of this embryo for any reason would be morally impermissible

An interesting take on when this born child has rights or values such that of another living human being is stated by Rabban Simeon ben Gamliel, “any human being who lives thirty days is not a *nephef* [abortus] because it is stated. And those that are to be redeemed of them from a month old shalt thou redeem (Num 18:16). Since prior to thirty days it is not certain that he will survive” ([www.myjewishlearning.com](http://www.myjewishlearning.com)). This is different from the belief that once a fetus is born it has the same legal rights and value as any other person. However, although the Jewish belief is that viability of a child is not certain until after 30 days, it should be noted that a newborn child’s life still has the moral right to be protected from harm doing. The possibility of viability outweighs the interpretation of the scripture that the fetus does not have real human value until not only born, but thirty days after the actual birth.

.The authority of the Jewish community does not look for texts or passages in the Torah for reason for or against embryonic stem cell research. They rely more on what would be deemed morally and ethically acceptable in accordance with today’s standards. Rabbi Mosche, a noted medical ethics authority involved in the Jewish community states that, “such research should be encouraged. A fertilized egg in a petri dish does not have ‘humanhood’(Wahrman 54). Furthermore, Rabbi Tzvi Flaum believes “you can discard it, you can do medical research on it, you can freeze it for implantation in the future” (Wahrman 54). The Fetal Tissue Resolution of the Union of

American Hebrew Congregation was constructed in 1993 and relies on two major decisions and guidelines that the Jewish community goes by:

1. Support the use of fetal tissue for the purpose of life-saving or life-enhancing research and treatment with the informed consent of the donor.
2. Support good faith legislation and regulations to prevent exploitation, such as a ban on the sale or purchase of fetal tissue from donors, provided that they do not conflict with our prior resolutions regarding reproductive rights.

The Fetal Tissue Resolution of the Union of American Hebrew Congregation states that “there is an emerging consensus of Reform Jewish authorities that tissue obtained from either therapeutic or spontaneous abortions may be used for purposes of life-saving or life-enhancing research and treatment. Jewish requirements that we use our God-given knowledge to heal people, together with the concept of pikuakh nefesh (the primary responsibility to save human life, which overrides almost all other laws) has been used by Jewish legal authorities to justify a broad range of organ transplants and medical experimentation. These requirements likewise justify the use of fetal transplants” (Wahrman 54).

The key to the acceptance of embryonic stem cell research in the Jewish community is that of protecting and enhancing a person’s life. The implications of this type of research involve ending suffering for many disease sufferers. The Jews recognize the benefits of embryonic stem cell research and support it for these benefits. “The crucial distinction here is between the permissible act of correcting a defect and

the forbidden act of attempting to approve on God's creations" (Jakobovits). This being said, it is acceptable to correct a genetic defect such as Down's syndrome, but it is not allowable to correct such a genetic phenotype such as hair color or eye color. This would be seen as intending to alter God's creations in a way that is not a necessary element to enhance the quality of life. Because of this, cloning would also be an area that the Jews deem off limits as being morally wrong. This would be considered to be manipulation of the genes and is not allowed as such.

Perhaps part of the reason that embryonic stem cell research is acceptable may be in part to the fact that the Jews are more neutral on the subject of abortion and what a fetus' value has in the scheme of life. Exodus 21:22-25, as noted above in terms of the Catholic religion, talks about a situation where two men are fighting and one accidentally strikes a pregnant woman during the fight. The Torah says, that if the woman is killed then a *nefesh* shall be given for a *nefesh*" ([www.myjewishlearning.com](http://www.myjewishlearning.com)). This means that a life is given for a life, as *nefesh* is a Hebrew term for a life. This passage goes on to say that if the woman miscarries, but does not in fact die, that the man must pay her monetary compensation. The man "is not liable for murder because the fetus is not considered a *nefesh*, a human being" ([www.myjewishlearning.com](http://www.myjewishlearning.com)). This belief that a fetus does not have the same value as a human life leads one to understand perhaps where the acceptance of embryonic stem cell research comes from.

Judaism has set a belief system in place surrounding life and when it begins and what value that said life has. Life begins at conception, the fertilization of a sperm and



an egg. What value does this fertilized egg have in terms of moral rights and potential for life? The Jews believe that if implantation occurs of this fertilized egg in a woman's womb, destruction of this embryo can only occur if it in fact interferes with the well-being of the mother. Human value of a fetus begins once any part of that fetus breaches the world with its presence. At this juncture, the fetus has the intrinsic value of life as does every other human being. However, a child less than thirty days old is considered to only have the possible viability of life, although protected from harm. That being said, an embryo produced in a petri dish outside of a womb, may be used for embryonic stem cell research or other scientific research as the benefits of this research might be substantial. More socially and technologically progressive, the Jews view any scientific research that does not directly harm what is considered to be human life, is morally acceptable and permissible.

### **Conclusion**

The religious beliefs surrounding embryonic stem cell research differ from religion to religion. Many of these differences can be noted in different translations of passages from religious texts. It is notable that the same exact passage is often translated or derived to have meaning that is different between two religions. Much of these differences can be attributed the feelings that a religion has towards the polemic topic of abortion. For this reason, the subject of when life actually begins is an important area of study when referring to embryonic stem cell research and the ethical implications surrounding it.

The Catholic religion and the Jewish religion have different viewpoints and perspectives when it comes to the notion of when life begins and when life has meaning. These thoughts and beliefs come from years of translation of the Bible for the Catholics and the Torah/Kurant for the Jews. These interpretations are done by high ranking officials, some scientists, within the respective religions. Due to the position of these officials, these explanations are believed to be accurate and meaningful for the religious followers. The construed opinions are recognized worldwide as basis for the debate surrounding not only embryonic stem cell research, but also abortion. It is due to the steadfast beliefs against abortion that embryonic stem cell research is seen as sac-religious for certain religions. The fear among these religions is that if embryonic stem cell research is permissible, it is in some conceivable way condoning the act of abortion.

The Catholic religion specifically refers to texts in the Bible to support their belief against embryonic stem cell research, while the Jews refer to similar texts and passages to support their belief for embryonic stem cell research. In particular Exodus 21: 22-25 is an interesting excerpt as both the Catholic and the Jewish religions refer to it as to give reference to the belief system set in place about said research. The importance surrounding this passage is clear as it specifically relates to a fetus and the possible harming of one and what it means to the specific religion. The Catholics translate this passage to mean that a fetus should never be harmed as it is viable in life in every way. The Jews translate this passage to mean that if the woman is harmed then punishment should be enforced equal to that of the physical harm. What can be

attributed to this difference in interpretation? One can only assume that it relates back to the abortion debate. Although the Jewish religion is against abortion, the Catholic religion takes a much harder stance against it. Due to the fact that the Catholics are very much against abortion, for them the issue of embryonic stem cell research is seen along the same lines. Because of this, they must translate any passage relating to a fetus to mean that harming a fetus in any shape or stage of life to be ethically wrong and religiously immoral. The Jews are more subjective and vague when referring to this particular passage. The Jews are against abortion, but are for embryonic stem cell research. Therefore, their interpretations must be a little more dependent upon the circumstance. For example, as noted above the Jews believe that life does not have humanhood until after forty days after birth. However, it is interesting to note that although they don't believe that life has real value until thirty days, they are against abortion as it is seen as deliberately and unnecessarily ending the potential for life or humanhood.

The passage above is quite ambiguous and up for interpretation as although it refers to injury and the punishment for the cause of said injury, it does not make clear whether the harmed person is related to the fetus or the mother. If one were to assume that the harmed person that is being referred to is in fact the mother, then the Catholic religion would have no evidence through this passage to support their claim against embryonic stem cell research. It would be clear, then, that harming a fetus no matter what stage of life would be punishable in the eyes of God. Or does it? If it is referring

to the fetus, it talks about giving birth premature, but does not talk about the physical detriments to this premature birth. This passage can be interpreted in a supporting way for the Catholics to back up their belief against embryonic stem cell research. However, if this passage were directly referring to the fetus as being the harmed individual and punishment due to harming said fetus, then the Jews would have less proof or confirmation that embryonic stem cell research is permissible.

An additional passage that can be up for interpretation in order to back up both of these religions and their beliefs surrounding embryonic stem cell research can be found in Jeremiah 1:5 as previously stated. The Catholics are able to use this passage to relate back to their feelings against abortion and stem cell research as it clearly states that God creates all creatures and implies that he has a specific plan for each individual. On the other hand, the Jews can interpret the same passage to support embryonic stem cell research as the embryos used are formed in a petri dish, outside of the womb. What causes these differences of interpretation? Once again the passage is very ambiguous and can be construed in whichever way one desires in order to give proof or evidence to support one opinion or another. It must all relate back to the topic of abortion and how each religion feels about the topic. Shared beliefs on abortion in this case, lead to different beliefs on embryonic stem cell research. Perhaps one religion is worried about the implications that could be made if embryonic stem cell research is found morally acceptable amongst the religious followers.

One must also look at not only passages in religious texts, but also to the officials behind the interpretations and religious rules as to why differences stem amongst

similar religions. As Catholics and Jews share the same God and somewhat of the same foundation for their religious beliefs, it is important to investigate and understand what or who governs the moral beliefs and practices of each religion. The Catholic Church relies on the Vatican and specifically, the Pope to make decisions on morality and religious issues. Behind the Pope stands a crew of officials, some with science backgrounds to aid in the decisions made around embryonic stem cell research. The Jewish religion relies on professionals that study Judaism such as Rabbis with science backgrounds in order to make decisions within the religion. Specifically, when it comes to the topic of embryonic stem cell research, the Jews rely on the Fetal Tissue Resolution of the Union of American Hebrew Congregation. It is noteworthy that a special committee has been made to undertake the questions and rules surrounding fetal tissue, in particular with the topic of embryonic stem cell research.

Placing a specific committee in charge of a specific topic was a genius move upon the part of the Jewish religion. It is much easier to be against abortion and for embryonic stem cell research, if one completely separates the two and treats them as two different subjects. Likewise with the Catholic religion it is easy to make embryonic stem cell research immoral if basing it on beliefs surrounded by abortion. The Jewish community successfully separates the two controversial topics in order to back up their belief against abortion and support their belief for stem cell research. Without separating the two, it would be hard to not have conflicting opinions and hypocritical thoughts.

In conclusion, the real debate surrounding embryonic stem cell research is much more complicated than that of studying when life begins. One must take a deeper look at a religion in particular to its views on abortion and potential for life. The Catholics claim embryonic stem cell research is immoral as they liken it to that of abortion. Meanwhile, the Jews separate the issues of embryonic stem cell research and abortion. In this way, they are much more able to have different feelings towards each individual issue and defend them as such.

### Works Cited

Bellomo, Michael. The Stem Cell Divide. Library of Congress. New York. 2006.

Castillo III, David. *For Faithful, Debate Rests on Origin of Life*. Newspaper *Missourian*.  
2006.

Peters, Ted. The Stem Cell Debate. Fortress Press. Minneapolis. 2007.

Wahrman, Miryam Z. Brave New Judaism: When Science and Scripture Collide.  
Brandeis University Press. New England. 2002.

Websites that were cited or referenced.

[www.myjewishlearning.com](http://www.myjewishlearning.com)

[www.associatedcontent.com](http://www.associatedcontent.com)

[www.urj.org](http://www.urj.org) (Fetal Tissue Resolution)