Bioethics of Stem Cell Research

By Clement Aroh

Bioethics is a set of conducts or moral principles that guide research in biology and medicine. The term "bioethics of stem cell research" has been a center of debate, particularly regarding the use of human embryonic stem cells (hESCs) for regenerative cures.

As a scientist working in the field of stem cell research, I view it as the future of medicine and a worthy pursuit for reliable treatment alternatives for diseases that cause unspeakable human suffering.

I believe it is this quest for treatments aimed at diminishing human suffering that show stem cell research scientists have a commitment to protecting life, which often runs counter to what people opposed to stem cell research believe. Here, I hope to share my view of the debate and also provide a framework to help others form their own informed opinions regarding the bioethics of embryonic stem cells.

When the first "test tube baby" (in vitro fertilization, IVF), Louise Joy Brown, was born on July 25, 1978, the whole world stood in awe and received her with excitement. Many global organizations described her as a "miracle baby," which is perhaps ironic given that she is a result of applied scientific research to medicine.

Later, in 1998, major public outcry regarding bioethics of stem cell research arose when the first couple donated human embryos for stem cell research for infertility solutions. (The couple had used IVF as a solution for their own infertility issues, and as is customary in the IVF process, extra early stage embryos were produced.) Since then, bioethical issues surrounding the use of embryonic stem cells has persisted.

Despite promising breakthroughs in stem cell research, there are still many controversies regarding human embryonic stem cell research. Most oppositional arguments are based on personal beliefs, religion, and/or are politically motivated.

Public concerns are often centered on the belief that the harvest and use of embryonic stem cells is tantamount to murder. The bioethical puzzle has hinged on the question: "when does life begin"? This question has been the focus of many ethical, legal, and political debates about embryonic stem cell research.

Some believe that life starts at the moment of conception, when an egg cell is fertilized by a sperm cell. Some argue that life does not begin until the fetus has a heartbeat (5 ½-6 ½ weeks) or when the fetus can survive without the mom and so may be technically regarded as separate from her body (~20-23 weeks). Others believe that life begins at birth.

While people may disagree widely on this topic, scientists certainly agree that after conception, a one-cell stage zygote is created, which has the ability to enter a developmental program with the potential to create a human being.

A common misconception is where embryonic stem cells come from. To understand this, you must first learn a bit about early development and IVF.

In the first 7-10 days following conception the zygote develops from a single cell into a sphere of about 120 cells and looks a bit like a raspberry, but is only about the size of a grain of sand. This stage of development happens in the fallopian tubes. Once the ball of cells, referred to as a blastocyst at this stage, gets to the uterus it will hopefully attach to the uterine walls and implant. Further development then proceeds within the mother's uterus.

A blastocyst is what is created when couples visit an IVF clinic. Scientists combine sperm and egg in a petri dish and allow development to proceed to the blastocyst stage. The healthiest looking blastocysts are then implanted into mom because development cannot proceed normally after this stage.

Because IVF is an imperfect and arduous process, many blastocysts are usually created (anywhere from 8-30). Often some of the blastocysts may not appear normal, or the implantation process may not work the first, second, or even third time. Creating extra blastocysts allows scientists to select healthiest blastocyst and have multiple implantation trials.

IVF couple must then decide what to do with the remaining blastocysts. At this stage, the cells are at such a primitive state that they can be frozen at -80 degrees for up to 10 years (this is not true of later stage embryos). When couples decide they will not be using their extra blastocysts, they have three choices: 1. Have them discarded as medical waste, 2. Allow them to go up for "embryo adoption" by a couple that cannot create viable blastocyst, or 3. Donate them for research.

This is where embryonic stem cells are derived from: donated blastocysts from IVF clinics that would otherwise have been discarded (assuming the couple was opposed to adoption, for their own personal reasons). It is important to stress that these cells cannot be turned into an embryo in a lab. They are removed from the sphere, put into a petri dish and factors are added so that the cells will remain in a primitive state.

From this point, scientists can study the cells and manipulate them in ways that will allow them to develop cures for children and adults suffering from diseases ranging from congenital birth defects, cancer, diabetes, heart defects, blindness, etc.

If a person supports IVF, they need to come to terms with the fact that many blastocysts end up being discarded. As a scientist, I believe it honors that potential life much more if the cells are used to address outstanding human health care challenges and as a tool to create improved treatments through regenerative methods.

The bioethics of stem cell research often sound like a utilitarian approach to solving problems; "if the benefits outweigh the risk" then it is acceptable. Like the ancient Greek word "*epidosis"*- any donation made for benefit of others is morally acceptable. The use of human

embryonic stem cells in research is like a donation made to save many lives from suffering and disease.

Bioethical debates surrounding stem cell research will likely never end…and there are often new reasons for fresh debate. Recently, United Kingdom (UK) Human Fertilization and Embryology Authority (HFEA) set a gold standard in human embryonic stem cell research and regenerative cures by approving the use of a standard scientific technique known as CRISPR. The endorsement allows the technique to be used for the correction of human inborn defects and genetic diseases at the embryonic stages. The current endorsement by the UK HFEA is receiving rave reviews from scientists and non-scientists around the globe. But now a new bioethical debate is born. The recent debate centers on the fear of possible manipulation of human genetic codes for non-ethical reasons. While most scientists have dedicated their lives to improving quality of life rather than destroying it, there will always be fear of misuse of technologies.

As the Italian astronomer, Galileo said, "all truths are easy to understand once they are discovered; the point is to discover them." I suppose when it comes to ethics, we all have our own personal truths. Regardless of one's political or moral stance, it is undeniable that stem cell research has advanced medicine. I am thankful that bioethicists work hard to tackle complicated questions that do not have easy answers. Perhaps the most we can hope for is that we as a community educate ourselves so that we may understand the different considerations of bioethical debates. We may not agree, but hopefully all sides are focused on helping people.