



The Stem Cell Debate

*The cloning of Dolly in 1997 opened up the “cloning debate”. Since then we have moved on to the “stem cell debate”. Most people are mystified by the claims and the confusing terminology. But you don’t need a biology degree to understand all the terms, writes **Dr Amin Abboud**. The fundamental ethical issues are easy enough to understand.*

Why are we having this debate?

Regenerative medicine is an exciting new field of medicine in which different techniques are used to repair damaged organs and tissues. Stem cell therapy is one avenue of regenerative medicine. Stem cell therapy has enormous potential for good. The ethical issue is not whether to use stem cells or not but where we get the stem cells from. The destruction of embryos for stem cells for stem cell research is ethically unacceptable.

What are stem cells?

Normally a skin cell remains as a skin cell all its life. A nerve cell remains as a nerve cell until it dies and so on.

Stem cells, however, can change into many types of cells — heart cells, nerve cells, muscle cells, skin etc. That is why they are called stem cells. They are the stem or trunk from which the branches (different cell types) can proceed. Because of this capacity they may prove useful for treatment of some medical conditions as they can be trained in different directions.

Where do stem cells come from ?

Adult stem cells: Stem cells can be taken from living humans (children or adults) without harming them. These are called adult stem cells.

Embryonic stem cells: These come from embryos. The embryo is destroyed and its stem cells are extracted.

Adult stem cells, despite their name, can be taken from children or adults, without harming them, or from umbilical cord blood after the birth of a child.

What are the benefits of stem cell treatment?

Stem cell research may benefit many conditions, including Alzheimer’s disease, Parkinson’s disease, diabetes, spinal cord injuries, heart disease and cancer. The new cells may be able to replace damaged tissue.

But it must be remembered that such benefits may be a long way off as they are complex diseases and the cures are never simple. We need to be optimistic but also realistic.

The only stem cells that have helped patients so far are adult stem cells. Embryonic stem cell research has not helped a single patient. It has a zero success rate.

How do we get stem cells from embryos?

They come from the destruction of “surplus” IVF embryos or by creating (i.e. cloning) embryos.

How are stem cells obtained from surplus IVF embryos ?

Scientists thaw the frozen embryos, and divide or separate the early stage embryo (usually about 5 to 7 days after fertilization) into its component parts. This kills the embryos.

The stem cells are placed in cultures where they can multiply. They grow into colonies, or clusters, of cells. They are then programmed to become the desired specified cell (e.g., heart cells), which can develop into tissue.

How are stem cells obtained from cloning of embryos?

Another option is to create new embryos, via nuclear somatic transfer, as in the cloning of Dolly the sheep. That is, human embryos would be deliberately created for the sole purpose of extracting their stem cells. This is often called therapeutic cloning, a terrible misnomer as it is not therapeutic for the embryo.

Some scientists and biotechnology businessmen say that human cloning could create a continuous supply of stem cells. They are basically proposing the creation of embryo farms for the treatment of patients.

What about adult stem cells?

The stem cell research that has worked successfully is adult stem cell therapy. We have known about adult stem cells for about 30 years. We can access adult stem cells in many parts of

our own body; the brain, bone marrow, skin, fat and many other locations.

Australian researchers in Melbourne have found a technique which may help in getting adult stem cells from the human brain. This could mean a cure for people suffering from Parkinson's disease and other neurological conditions.

The success of using these cells to treat patients has been impressive. This research does not destroy embryos and does not need cloning. And, what is more, it has been very successful. A recent article in the magazine *New Scientist* described one type of adult stem cell as "the ultimate stem cell".

Which cells should doctors use?

The media gives the impression that there is no alternative to embryonic stem cell research. But this is a deception propagated by those with a personal interest in destructive embryonic stem cell research. No one has a right to destroy embryos to do this research. We should push ahead with successful and ethical adult stem cell research which involves no destruction of embryos. Even better, it works.

What is the link between embryonic stem cell research and cloning?

Embryonic stem cell research is the threshold of cloning. IVF embryos can be used for research but probably not for therapy. If an embryonic stem cell were injected into patients it would be rejected by their immune system. To overcome this problem, scientists suggest making clones of their patients to extract the stem cells. These could be injected into the patient without risk of immune rejection, as they have the same genetic code as the patient's cells. But if the clone were allowed to keep developing in a womb, a baby would be born. Some scientists claim that making a clone to extract stem cells (so called "therapeutic cloning") is acceptable while making a clone to grow as a complete baby ("reproductive cloning"), is bad. They are both unethical.

Is this a clash between religion and science?

No. This debate is about good science versus bad science. Good science is ethical science. The ethical science here also has all the successes. Religious convictions contribute to the

Only Adult Stem Cells have runs on the board

Adult stem cell research has made amazing progress. Although it will be years before it can be used as a standard therapy, it has already produced very promising results. Here are a few examples of what has been reported in leading scientific journals.

- In Dusseldorf, in July 2001, German doctors reported that a patient's own bone marrow adult stem cells were used to regenerate tissue damaged by a heart attack, improving his heart function.
- US doctors have taken adult stem cells from the brain of a patient with Parkinson's disease and reimplanted them resulting in an 83% improvement in the patient.
- Washington Medical Centre treated 26 patients with rapidly deteriorating multiple sclerosis. Twenty patients stabilised and six improved.
- Israeli doctors inserted adult blood stem cells into a paraplegic woman's spinal cord. She regained bladder control and the ability to wiggle her toes and move her legs.
- Immune systems of children destroyed by cancer were restored using umbilical cord blood (these are adult stem cells).
- Surgeons in Taiwan have restored vision to a patient with severe eye damage using stem cells from the patient's own eyes.
- In the US adult stem cells have been used to treat sickle cell anaemia.
- Adult pancreatic islet cells were beneficial in helping 15 patients with insulin dependant diabetes improve.
- A young woman rendered paraplegic by a car accident can move her toes and legs after injection of her own immune-system cells into her severed spinal cord.
- In the UK a three-year-old boy was recently cured of a fatal disease by the use of stem cells extracted from his sister's placenta.

public debate by highlighting the importance and scope of human dignity. But the fundamentals of the debate are set by what constitutes competent ethical science which respects human rights.

Why are some scientists pushing embryonic stem cell research if the use of adult stem cell is both useful and ethical ?

It used to be said that embryonic stem cells are more effective than adult stem cells for the following reasons:

- Embryonic stem cells are easier to identify, isolate and harvest.
- There are more of them.
- They grow more quickly and easily in the lab than adult stem cells.
- They can be more easily manipulated (they are more plastic).

Yet all these arguments have proved false. The first two claims are misleading. Harvesting is a non-problem. Scientists have been extracting some types of human adult stem cells for almost a decade. (Think of bone marrow transplants.) But human embryo stem cells weren't successfully isolated until 1998. Several biotech companies have developed proprietary methods to make adult cell isolation and extraction even easier.

Scientists have discovered stem cells in adults in virtually every major organ, including the brain and body. Researchers last year identified conditions that would allow for the multiplication of adult stem cells in culture by a billion-fold in a few weeks.

The key argument for using stem cells from embryos is they are more "plastic" — that is, they are easier to change into other types of cells. While this claim has some basis, the technology is improving so rapidly that it is hard to substantiate. The US National Institute of Health report has noted, "the field of stem-cell biology is advancing at an incredible pace with new discoveries being reported in the scientific literature on a weekly basis." The advantage of using embryo stem cells may already have been superseded by researchers.

While adult stem cells may never be as "plastic" as embryo stem cells, they will almost certainly be plastic enough. "These adult tissues don't appear to be as restricted in their fate as we thought they were," said Dennis Steindler, a professor of neuroscience and neurosurgery at the University of Tennessee-Memphis. "In some ways they may not have the same potential as embryonic cells, but once we figure out their molecular genetics, we should be able to coax them into becoming almost anything we want them to be."

Why shouldn't we use embryonic stem cells for cures and research?

1. *It is unethical.* The process of obtaining them destroys a human embryo. The destruction of human life cannot be justified, even if the aim is to save other human life.

2. *Embryonic stem cells can cause cancer.* Embryonic stem cells are versatile but they can also become malignant. Their potential for causing cancer is a real concern for researchers. The editor of the journal *Stem Cells* made a startling admission last year: "I continue to think that clinical application is a long way off. Prior to clinical use of embryonic and foetal stem cells, it will be necessary to thoroughly investigate the malignant potential of embryonic stem cells." Adult stem cells seem to be more stable than embryonic stem cells and are not as prone to forming tumours.

3. *It is unnecessary to use them.* Adult stem cells are proving to be a viable alternative. For example umbilical-cord blood and placenta blood are both rich in stem cells. Scientists have found stem cells in adults in virtually every major organ, including the brain. And as we have seen, they have already been successfully used in treatment, while embryonic stem cells still offer only theoretical potential for good.

This point is worth emphasising: While many actual benefits have been obtained from Adult stem cells over recent years, we have as yet no demonstrated benefit to human patients from embryonic stem cells.

4. *The benefits of embryonic stem cells are a long way off.* Most scientists admit that all the potential benefits of embryonic stem cells are still distant. Sir Gustav Nossal and other experts have observed that no real breakthroughs are expected for many years to come. Moreover, they say, it is sure to be an expensive and difficult endeavour. In the meantime, many adult stem cell breakthroughs have already taken place. Unfortunately the scientists who are pushing for embryonic stem cell treatment make it sound like the benefits will happen tomorrow, giving many sick people false hope.

5. *The use of adult stem cells seems to overcome the problem of immune rejection, which will be a big problem with the use of embryonic stem cells.* Our bodies quickly recognise and try to kill off foreign tissues implanted in them. By using cells from oneself, the compatibility problem is avoided. There is something holistic and natural about using adult stem cells. In some experiments in which embryonic stem cells were used as therapies, the patients actually got worse.

6. *Embryonic stem cell research is not driven by hope for cures, but by a lust for profit.* Many of the

cell lines are in the hands of private companies. The amount of vested financial interests in this area are staggering. Big Biotech has the same profit-driven agenda as other industries that are viewed sceptically by the media such as Big Tobacco and Big Oil.

What about “reproductive cloning”?

Almost everyone agrees that “reproductive cloning” should be banned. But if we allow cloning for research, unscrupulous people will inevitably push for cloning an embryo to produce a child. Already in the US a few couples have made public requests to clone dead children. They demand this as their “reproductive right”. What unscrupulous scientists have not achieved may be achieved by unscrupulous lawyers. So the time to stop reproductive cloning dead in its tracks is *now*. Later on we may become used to the idea and allow it.

Does an embryo deserve the same respect as a person?

Research on embryos is research on embryonic persons. It denies the dignity of the human embryo. The human embryo is a distinct, living human being and is entitled to the same rights as any other human being. Human life begins at conception (or fertilisation). Therefore, the human embryo, regardless of what means by which it is created, should not be treated as a means to an end. It is entitled to life and respect.

Once embryonic development commences, a separate and distinct human being exists. As such, the embryo should not be used in a purely instrumental fashion. Any technology or “therapeutic” procedure which involves the destruction of a human embryo should be banned.

Won't embryos be destroyed anyway? Why not do something useful with them?

Those who argue that the frozen embryo would be destroyed anyway miss the point. Couples had the embryos created for implantation and bringing about new life. The existence of surplus embryos is a real concern. It has become a scientific embarrassment and legal mess created by the IVF industry. But we should not add to the mess by experimenting on embryos.

We need to find a humane solution to the ethical dilemma of surplus IVF embryos. Some have proposed adopting out the embryos. This is being done in the United States on a small scale. But whatever we decide, it must be an option which treats them with dignity and not as a quarry for body parts.

Maybe we can learn from a recent incident in Austria. A Nazi doctor had built up a collection of murdered children's brains preserved in formaldehyde. He wrote scientific papers based on his studies of the brains and became a distinguished public figure. When this scandal came to light, Austrians were aghast and the body parts were buried in a dignified public ceremony attended by thousands of people. No one argued that these children were dead anyway and that the doctor should be allowed to continue his research to push forward the frontiers of science.

There is a lesson here for the controversy over “surplus” IVF embryos. A mistake has been made, but the way to set it right is not to destroy embryos, but to treat them with dignity and respect that their remains deserve.

_____ by Dr Amin Abboud

Seven key ideas about stem cell research

1. Good science is ethical science.
2. There are two types of stem cells – adult stem cells taken from your own body and embryonic stem cells obtained by killing an embryo.
3. Adult stem cells are very successful and are ethical.
4. Destroying embryos for research is unethical.
5. Destroying embryos for research is not necessary to obtain cures.
6. Embryonic stem cell research will inevitably lead to cloning human beings.
7. Destructive embryonic stem cell research must be banned.