

# Understanding stem cell science

WITH PETER HOLLANDS, Ph.D.



**Peter Hollands Ph.D.(Cantab), C.Sci., FIBMS has worked in stem cell technology for nearly 30 years. His current interest lies in the use of cord blood stem cells in the treatment of blood disorders and regenerative medicine.**

## **Regenerative medicine: Science fiction or science fact?**

Everywhere, it seems, we hear about the promise of regenerative medicine. The pundits claim that major chronic illnesses, such as diabetes and multiple sclerosis, are close to a cure and that acute conditions such as traumatic spinal cord damage will soon be repaired just as easily as putting a bandage on a cut. This utopian view of regenerative medicine is much loved by the media, politicians and medical research charities. It provides the momentum for much of the current research into human embryonic stem cells. Nevertheless, can we believe what we see and hear? Is there a hidden agenda behind embryonic stem cell technology? Do we really have to sacrifice human embryos for the advancement of medical technology?

## **Miles to go**

Stem cell technology is still in its infancy. It is only a little over 50 years since we realized that stem cells exist in bone marrow and a little over 20 years since the early pioneering work on stem cells from other tissues, including cord blood and embryos. We are just beginning to understand how stem cells work and how we can manipulate them to reach the ultimate goal of “off-the-shelf” regenerative medicine. At this point in such young technology, there is always a bullish optimism. Think back to the discovery of antibiotics, when the panacea for infectious disease was widely predicted. But in the 21st century, we still have deaths from highly resistant “superbugs” such as methicillin-resistant *Staphylococcus aureus* or MRSA. The human genome project was thought to herald similar advances, but today few, if any, therapeutic procedures utilize any of that technology.

Well, the same thing is happening with stem cells. We have interesting research observations, such as the development of heart muscle and nerves from stem cells, being hyped, but the reality is that the leap from observing stem cell differentiation in the laboratory and actually having a safe therapeutic procedure for a patient is enormous. The safety and regulatory issues alone are complex. The clinical issues for some diseases are far beyond anything we understand now and are likely to comprehend for some time.

My first point is, therefore, this: Yes, we have exciting new research in stem cell technology, but we must not attempt to run before we can walk. As we all know, this can result in a painful fall, with a lot

of pain, suffering, disappointment and even death for people who put their trust in stem cell technology.

### The message is clear

As I write, I am about one mile from a world-renowned center of excellence in stem cell research, located at Addenbrookes Hospital in Cambridge, England. Such centers are readily and heavily funded by medical research charities. They also receive government funding and support. Their research is often quite broad, and includes some adult stem cell work and a tiny amount of cord blood stem cell research, but the vast majority of their funding and support is for human embryonic stem cell research. Despite all this investment, embryonic stem cell technology has shown no progress towards clinical usage in the past 20 years.

In contrast, adult and cord blood stem cells are in current usage, with new protocols and applications constantly being developed. Clearly, embryonic stem cell research has yielded no progress towards therapeutic applications at all, whereas adult and cord blood stem cell research yields novel and useful applications on a regular basis. Yet we still continue to throw money at embryonic stem cell research. The media report on it with great enthusiasm, and politicians rarely mention any other forms of stem cell technology.

### 'The Emperor's New Clothes'

This is my second point: Stem cell research has been hijacked by media hyperventilation and political spin. The true science, which has always been based on adult and cord blood stem cells, is rapidly becoming

lost as we blindly follow an "emperor's new clothes" view of stem cell research, wherein everyone can see the supposed wonder of embryonic stem cells, until one little voice in the back is one day heard and the whole fiasco falls like the Tower of Babel. Once again, the people who will be most affected by such a revelation are those patients banking their future health and happiness on embryonic stem cell technology.

The big problem with most of the regenerative medicine technology currently being proposed is that it is based on the premise that, in order to make "progress," we must destroy human embryos to create stem cells. Anyone who has bothered to make an even cursory study of stem cell technology knows this is patently untrue.

Human umbilical cord blood, for example, contains stem cells capable of making a wide range of tissues in a safe and relatively straightforward manner. Cord blood is biological waste, and the cells it contains produce safe and noncontroversial tissues for research—and eventual clinical use—at a fraction of the cost (financial, moral and ethical) of embryonic stem cells. Adult stem cells, taken either from adult donors or the patients themselves, are also proving to be a safe and reliable source of stem cells for therapeutic use.

Despite this, there is little public recognition of the potential of cord blood and adult stem cells, but much praise for the use of embryonic stem cells. When will we see that the emperor is naked? I hope it is sooner rather than later, for the sake of those people awaiting the true birth of regenerative medicine.

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