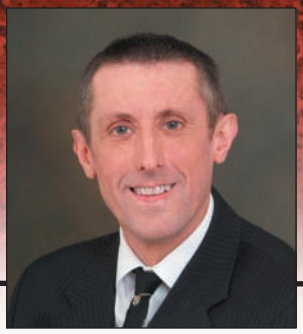
Understanding stem cell science

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.

In my previous article, I reviewed embryonic stem cell technology and highlighted the major problems with that source of stem cells. Now we'll explore adult stem cell technology which is, in many instances, tried and clinically tested. Best of all, it presents no legal, moral, ethical or religious objections to its use.

Bone marrow successes

For over 50 years, stem cells have been taken from adult bone marrow and transplanted to treat various afflictions in a patient's body. A general anesthetic is required in order to collect bone marrow from the pelvic bone of the donor, although technology allows the use of drugs to stimulate bone marrow stem cells to move into the general blood circulation. These peripheral blood stem cells can then be harvested directly from a peripheral vein using specialized collection technology. Bone marrow stem cells are therefore critical to the history and current clinical practice of stem cell transplantation, especially in the treatment of leukemia and related blood disorders.

More recently, bone marrow stem cells have been shown to have a possible role in the repair of heart muscle following a heart attack. Bone marrow is collected from the heart attack patient and injected directly into the site of the heart attack to enhance repair and recovery. Several clinical trials are underway to fully assess the clinical efficacy of this technique.

Bone marrow stem cells also have been shown to be very useful in the treatment of tendon damage in racehorses. Such an approach has already saved the lives and careers of many racehorses. Therefore, clinical trials are planned for a similar approach in humans.

Bone marrow stem cells play an immensely important role in current routine stem cell transplantation and further research and clinical trials will no doubt identify even further applications for these important stem cells.

Cord blood applications

Every time a baby is born, blood remains in the umbilical cord and placenta which contains lifesaving stem cells. However, people throughout the world continue discarding this blood despite the fact that it is very easy to collect and process cord blood stem cells, then store them frozen in liquid nitrogen. In this form, cord blood stem cells are, in the-

ory, stable indefinitely and can be thawed to use in the treatment of leukemia and blood disorders where bone marrow stem cells are unavailable.

Cord blood stem cells have currently been transplanted over 8,000 times worldwide to treat 45 different blood disorders. Thus, steps are needed internationally to ensure that this extremely important source of stem cells does not continue to be discarded.

Private stem cell banks are available that will process and store cord blood stem cells for family use, but much more investment is needed in the provision of public cord blood banks to provide cord blood stem cells for everyone in need.

It also has been shown that cord blood stem cells are capable of producing other tissue types, making them a potential source of stem cells for use in a range of regenerative medicine applications. Clinical trials are planned to explore the treatment of multiple sclerosis and acute stroke. Many other trial applications will no doubt follow in the future.

Other adult sources

Stem cells are constantly being identified in a range of adult tissue, including the umbilical cord itself, the placenta, baby teeth and even the fat obtained during liposuction. The stem cells from these different adult tissues show different properties, but all have the ability to repair a range of tissue types.

Many private banks offer processing and storage of these cells, although at the moment, there have been no clinical trials of the technology. Nevertheless, developments such as these show the wide range of adult stem cells potentially available for clinical use.

Looking forward

Stem cell biology has come a long way in the past 10 years. When I first worked in the field 30 years ago, there was very little interest even from fellow academics. Today everyone talks about stem cell technology, it is reported in the media on a daily basis, investment levels are extremely high in some areas and cutting-edge research teams are working all around the world to advance the technology.

It is, nevertheless, very important that we keep the whole of stem cell technology in perspective in order to realize that adult stem cells have by far the most potential of any stem cell type and, in many instances, they are currently in use and saving lives. Unfortunately, adult stem cells do not get their fair hearing in the stem cell debate, they do not attract media attention and the level of international research funding is relatively low. The scientific community, the media, the politicians and governments worldwide should recognize the importance and potential of adult stem cells to ensure that we all receive every possible benefit from this technology.

Peter Hollands, Ph.D. (Cantab), C.Sci., FIBMS is a freelance stem cell consultant.

E-mail this article from our web site www.CLmagazine.org.