

## **Oklahoma Center for Adult Stem Cell Research**

## What are stem cells? Paul Kincade, Ph.D.

Cells are the basic building blocks in our bodies, and we have over 200 distinct types. Some cells last for our entire lives, and are difficult to replace if lost or damaged by disease. Examples are those that make up the heart and most of the brain. Other cells are designed to wear out quickly and are constantly replaced by "stem cells" present in adult tissues. Examples are cells in blood, skin and the lining of the intestine. Adult stem cells are vital to our health and not controversial. Some of them have been used for years to save lives. The Oklahoma Center for Adult Stem Cell Research supports scientists who work in several areas. Some of them study naturally occurring stem cells with the goal of learning how to better use them for tissue repair. Also, the same stem cells that keep us healthy sometimes turn into cancer cells and a better understanding of that process is very important. Still other scientists are learning how to "make" stem cells from adult tissues. The formal name is "induced pluripotent stem cells" or iPSC. Although still far from being useful for clinical treatment, this new technology makes it possible to turn any cell into other cell types, including ones that are not normally replaced. This should open a new field known as "regenerative medicine".

There are different types of adult stem cells, but they have two things in common. They can divide to make exact copies of themselves, or turn into one kind of tissue. For example, stem cells for blood normally cannot make skin. Stem cells for skin do not normally turn into blood. Thousands of people with diseases involving blood cells have been successfully treated with stem cell transplants. That is commonly called "bone marrow transplantation" because most blood stem cells live within bones.

Advances in stem cell research have caused a great deal of excitement and hope for incurable diseases. However, there has also been a lot of confusion and controversy. Studies with mice and later humans led to the discovery of "embryonic stem cells" or ESC. When grown in a test tube, ESC can be directed to become beating heart, nerve, pancreas or virtually any other cells. The FDA has approved a clinical trial to see if human ESC can be used to repair spinal cord injuries.

Fertilized eggs, such as those left over from *in vitro* fertilization are one source of ESC. Supporters of that type of research say that there is no connection to abortion because ESC have never been in the body. The fertilized eggs are obtained with strict consent of the parents, and would be discarded if not used in that way. Other people object to the use of anything termed "embryonic" for research or treatments. As mentioned above, it is now possible to make iPSC from adult tissues that are very similar to ESC. OCASCR believes that further work with adult iPSC has great promise.