



Research: Stem Cells

What are Stem Cells?

Have you ever thought about where you come from? How you were made? How did you grow from two tiny cells from your mother and father into a human mass of cells all performing independent functions?

The fact is our bodies are made up many different types of cells. We have skin cells, heart cells, muscle cells, bone cells, nerve cells, kidney cells. We even have cells that circulate through our bodies just fighting infections and keeping us healthy! There are more than 220 cell types in the adult body. Each of these cells performs different functions and keep our bodies working properly.

So, why is it that when I cut my skin my body can make new skin cells and heal the injury, but, when I injured my spine, it won't heal? Why does my body heal one part of the body but not the other?

The answer is stem cells. Stem cells are cells that have not been assigned a role in the body. Every cell in your body was once a stem cell. Think of them as cells waiting around for something to do. When you were first formed in your mother's uterus, you started as a just a few stem cells. These cells then divided – sometimes they were told to stay stem cells and other times they were told to become a specific cell in the body – to perform a specific role. Some went on to form the brain, others the heart, some the eyes, and so on until a fully formed baby was developed.

As you grew, your body continued to create new cells by dividing stem cells and sending them off to become bigger, stronger bones, blood, skin, etc. so that you could grow into a full grown adult. Once the stem cell has been told what to become, it will play that role forever. A skin cell can never become a heart cell and vice versa.

Stem cells can also help heal the body when it is damaged. Some areas of the body get many new stem cells joining their ranks as long as you are alive. For instance, in some organs such as the gut and bone marrow, stem cells regularly divide to repair and replace worn out or damaged tissues. In other organs, however, such as the pancreas and the heart, stem cells only divide under special conditions.

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Nerve cells communicate information from your entire body to the brain and from the brain to the rest of the body. For instance, reading a book requires nerve cells in the eyes to relay light and reflection to the brain so that the brain can translate the patterns into understanding. Additionally, nerve cells also communicate touch, sensation, and body movement to the brain so that the body can walk or shiver when it's cold or remove your hand from a hot plate. The central pathway between the brain and the rest of the body is the spinal cord. Every organ down to the tip of your toes connects to the spinal cord through nerve cells.

When you were a child, nerve cells were developed quickly and efficiently. You were learning how to walk, talk, read, write, catch a ball, and recognize danger – all of these activities require nerve cells to relay information to the brain. The brain gathers information and tells the legs how to move, how to hold a pencil, or what color to color with. But, once these pathways in the body were established, there was no need to develop new pathways for information to travel through the body. Therefore, after a few years, the development of nerve cells slows down.

The body is efficient – if it doesn't need to do a certain function, like create new pathways for information to travel between the body and the brain, it stops putting energy into that area and focuses on other activities. By the time you are a teenager or young adult, the ability to create new nerve cells has all but disappeared. While the stem cells you had as an embryo in your mother's womb could divide and become all cell types in the body, adult stem cells can only produce a limited number of cell types – nerve cells can usually no longer be made as an adult.

So, if the body can no longer make new nerve cells to repair the body as an adult why don't we take embryonic stem cells, put them in my body, and have them turn into nerve cells?

If this has crossed your mind, you're not alone. Scientists around the nation have wondered the same thing and have or are currently performing research to figure out how to do this. However, currently there is no safe, effective, and proven therapy to cure spinal cord injury. Scientists have **not** found a way to turn stem cells into nerve cells to heal spinal cord injuries.

Again... **there is no safe, effective, and proven therapy to cure spinal cord injury** at this time.

But I found this thing on the Internet...

Stem cell tourism – as it is commonly called –describes when a person purchases an experimental treatment, often involving transplantation of “stem cells.” Usually these treatments are given in countries that have very little or ineffective safety protections in place. This means that the clinics and companies offering the treatments do not need to prove their advertisements are true. They can claim they cure spinal cord injury or that their treatment has no risk and they do not need to prove it. Going to another country for an experimental treatment can be very expensive and dangerous.

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“Frequently, providers of these treatments attempt to establish a veneer of credibility by citing experimental studies, where they have no direct association. Most often the critical scientific data to support the safety and efficacy of the new treatments are lacking, so they rely on testimonials from patients or their family members. Patient-reported anecdotes are not a substitute for medical evidence” (Blight et al, 2009).

When a person pays thousands of dollars for an experimental procedure, they tend to want to believe that it worked. Most testimonials are taken just after the procedure is done and emotions and hopes are high. Unfortunately, testimonials do not count as scientific evidence.

Without rigorous research showing that the procedure is safe and effective – meaning it won’t hurt or kill you and that it actually does what it claims to do – an experimental treatment or procedure cannot be recommended or advised by Craig Hospital.

Remember - regardless of the testimonials and what the persuasive websites tell you – there is no therapy that has been proven through rigorous research to be safe and effective to cure spinal cord injury.

What do I have to lose?

You have a lot to lose – life is about more than being able to walk. In fact, after spinal cord injury, studies have found that priorities change and the things that are most important in one’s life change. In one study, 195 British spinal cord injured men participated in a research project that was carried out over several years. All of them were age 16 or older when injured, and by the time the research was done, they had all been injured at least 20 years. The study found that material things were not as important to the men with SCI as they were to the general population. The men with SCI reported that health and personal safety were most important followed by relationships with their spouse, family, and friends.

While almost all of us share similar broad goals – to be happy, to feel connected, to make a contribution to society – the way we go about reaching those goals, and how we measure those goals may be very different. Disability, in general, and spinal cord injury, in particular, are only two of many things that can alter how we look at our lives. In the study above, although the men with spinal cord injuries rated their health as important, they did not see either their health or their work as being critical to their quality of life! Instead, what they said what mattered most to their quality of life was socializing, recreation, having a spouse or lover, and having friends. None of these things are dependent on finding a cure for spinal cord injury but without your health, socializing and recreation with friends and family may become difficult which will decrease your quality of life.

So what are my options?

With a little searching on the internet, many reputable articles can be found about unscrupulous people posing as scientists or “respected” doctors offering “cures” for spinal cord injury that result in death or life-long debilitating complications.

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People who want to continue to learn about stem cell treatment and research need to become familiar with the International Society for Stem Cell Research – <http://www.isscr.org> – This organization is dedicated to ensuring that stem cell research treatments are provided in a fair, safe, and effective manner to patients.

People also need to become familiar with the National Institute of Health (NIH) in the United States for further information and explanations of clinical trials written and registered with the NIH. These can be found at www.clinicaltrials.gov/ct/info/resources/

More information on questions that should be asked of someone offering a treatment for SCI is available in the free document, 'Experimental Treatments for Spinal Cord Injury: What you should know'. This is available in several languages at the International Campaign for Cures of Paralysis www.campaignforcure.org.

While these databases and websites don't include all clinical trials they provide good information about current, rigorous, scientific research.

My sister is having a baby – Should I have the umbilical cord blood saved?

Just like bone marrow, saving umbilical cord blood and stem cells are *not* controversial so therefore isn't a political or ethical debate. Nearly 80 life-threatening diseases are treated from stem cells from cord blood at this time.

The cost of saving cord blood is initially expensive and needs to be planned prior to the delivery. There is also an ongoing monthly storage fee. Information about companies that provide this service can be discussed with the OB-GYN and/or looked up on the internet.

The use of cord blood stem cells for emerging treatments is still experimental at this time. Also success depends on many factors such as the recipient's health condition, the type of disease, and recipient-donor relationship and matching. There is no guarantee at this time that the umbilical cord blood will be a good match or provide a cure.

Craig Hospital's role

In addition to our clinical and program excellence, we continue to be involved in a variety of cutting-edge research projects, further ensuring the best possible treatments, for the best possible outcomes. Ongoing studies in the area of spinal cord injury include:

- Weaning off a ventilator
- Quality of Life Studies
- Impact of spinal cord injury on work force participation
- Improving outcomes after injury

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- Areas of concern for family members providing assistance to a loved one with spinal cord injury
- Potential human stem cell therapies in a joint laboratory study with the Karolinska Institute in Sweden
- Needs of underserved populations subcontracted with Medical University of South Carolina
- Aging with Spinal Cord Injury
- Safety and efficacy of using macrophage cells to treat complete spinal cord injuries
- Exploring genomics and biochemistry of neuropathic pain following spinal cord injury in a joint project with the laboratory of Linda Watkins, PhD. At the University of Colorado-Boulder
- Acupuncture as a treatment of acute spinal cord injury

To learn more about current research at Craig Hospital, check our website: www.CraigHospital.org.

What else can I do to be ready for when Stem Cell Therapy is approved?

Continue to have routine health exams, such as periodic spinal cord injury follow up exams. You also need to stay fit by exercising as you are able and eat healthy. Should trials be approved, the healthiest people will be called upon to participate.