

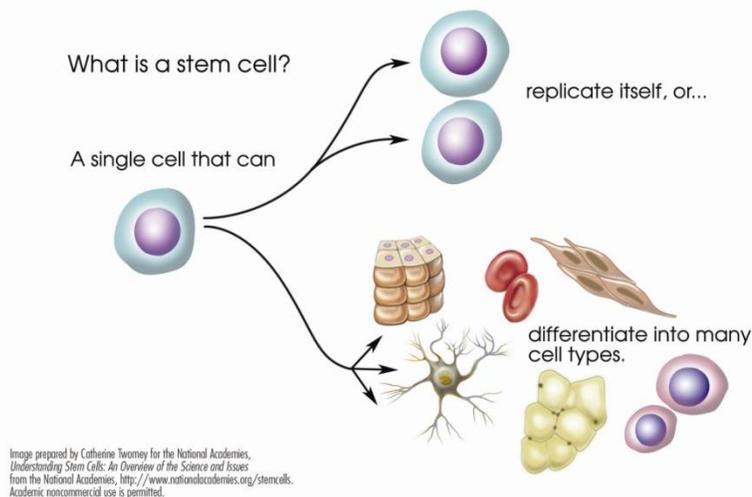
Will the real stem cell please stand up?

By John R. Goodman BS RRT

Stem cell replacement therapy for a wide variety of medical diseases or disorders has been a topic of discussion that seems to have been on and off the medical “radar screen” for many years now. In fact, the term “stem cell” first appeared in the scientific literature as far back as 1868. A German biologist named Ernst Haeckel used the term to describe the single-celled organism that acted as an ancestor cell to all living things in history. Jump forward to August 9, 2001 when President George W. Bush signed an order authorizing the use of federal funds for research on a limited number of existing human embryonic stem cell lines.

In January of 2009 the Geron Corporation announced the FDA’s announcement of approval for a limited phase 1 trial for a new treatment of spinal cord injuries based entirely on human embryonic stem cells. Later that year, President Barack Obama signed Executive order 13505 which loosened restrictions on human embryonic stem cell research. In July of 2009 the NIH issued revised guidelines for federal funding for stem cell research. Currently the National Institutes of Health approves of at least 13 new human embryonic stem cell lines for federal funding.

After a hundred and fifty years and many millions of research dollars spent....what do we know about stem cell replacement therapy, specifically their possible role in lung disease? Just exactly what is a stem cell?



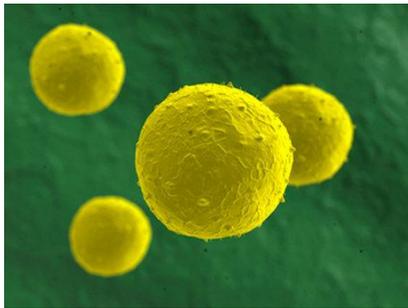
Stem cells are found throughout the body and have several main characteristics:

1. They can renew themselves by simple cell division.
2. They can differentiate themselves or take on properties of several different cell structures and tissues based on need.

3. They can be transplanted into other organisms where they will continue to divide and differentiate.

Adult stem cells can be found in the skin, bone marrow, brain, blood vessels, liver, and skeletal muscle. Theoretically, stem cells can be used to heal, regroup, or even regenerate damaged tissue. For the longest time it was believed that there were no stem cells located in the lungs themselves. Recently researchers at Brigham Women's Hospital (BWH) found stem cell evidence in 12 adult donor lungs and 9 lungs from fetuses that had died of natural causes. And much to everyone's amazement these stem cells were able to divide and form new lung structures!

In actuality, at least in the United States, stem cell replacement therapy is not being offered to patients with any form of lung disease. Stem cell pioneers see this therapy as perhaps a promising new direction to take in finding new ways to treat all lung disease including COPD. Finding adult stem cells in adult human lungs eliminates at least one of the very most powerful ethical dilemmas concerning stem cell replacement therapies. It eliminates the need for fetal blood from aborted fetuses. In the past 5 years stem cells have been harvested primarily from bone marrow. The harvested cells can then be returned to the lungs via intravenous or in some cases nebulized back into the patient.



Stem cell replacement may play a major role in treating lung disease in the future



Much safer to replace your own stem cells than from a donor

There is a great deal of controversy regarding the use of stem cell therapy to treat COPD. One interesting though mostly legal argument is that for stem cell treatments to be clinically significant, many millions of stem cells need to be transplanted back into the designated recipient. Harvested stem cells do not reproduce without outside manipulation to produce even larger quantities. The FDA says that manipulating naturally harvested stem cells with other agents technically turns the stem cells into prescription drugs. You know what that means??? More regulation of course. It will be interesting to see how this plays out in the courts. Although the number of studies vacillates a bit with the funding available, there are currently around a dozen studies actively looking at stem cell therapy and lung disease.

How exactly can stem cell therapy theoretically help patients with lung disease? Well, first it seems possible that there may be anti-inflammatory benefits to stem cell therapy. Also, it is entirely possible that stem cell therapy may actually trigger the production of reparative

growth factors. It is also possible that over time stem cell therapy could accelerate the regeneration of the alveoli and blood vessels of the lungs. Much of the hope for beneficial effects have actually been seen in mice. but as many an investigator has found over the years, it is a huge leap from to speculate on any possible effects on the human lung, based on itty bitty mice lungs.

So why aren't there hundreds of studies being done all over the world on stem cell therapy? Now that the huge ethical problem of aborted fetuses has been minimized if not completely eliminated, why haven't all the major clinical institutions renowned for previous work not just jump on the stem cell band wagon?

Well, after all this is the 21st century and we must begin all discussions with costs and end with return on investment (ROI). One of the more controversial aspects of SCR therapy is the wide variation in costs. A quick Google search of SCR centers show a range of between \$6000.00 to a whopping \$64,500.00! The vast majority of these centers reside outside the continental United States. These fixed costs do not include transportation, hotel or food expenses. SCR centers can be found just about all over the world...from India to South America, and from Mexico to China and the Far East. As might be expected, stem cell replacement therapy is not covered by any known health insurance plan.

It is interesting to note what the American Lung Association has to say in its *Statement on Stem Cells and Cell therapies for Lung Diseases*, "As yet, there is very little known about the short and long term effects of administering any type of stem cell therapy to patients with lung diseases. At present there are only a small number of approved clinical trials in the United States and Canada...we are hopeful there will be more in the future. However you may come across information on the internet or other sources about stem cells being administered to patients with lung disease. We caution all patients to carefully consider the claims of benefit being made by many of these programs as they have not been substantiated nor have they passed peer review for publication. Because of the potential for harm, the lack of any proven benefit, and the high fees that many of these programs charge, we caution you not to participate in these or any other comparable unauthorized or unapproved stem cell administrations, unless independent credible, reliable, and objective sources of information are available to substantiate the information and claims being made." The ALA recommends the International Society for Stem Cell Research (ISSCR) as a reliable source for information. If you'd like more detailed information please visit www.closerlookatstemcells.org.



This leads me to a topic sometimes known as "Stem Cell Tourism."

Here is what the ISSCR says in their recently published handbook for patients, “The ISSCR is very concerned that stem cell therapies are being sold around the world before they have been proven safe and effective. Stem cell therapies are nearly all new and experimental. In these early stages, they may not work, and there may be downsides. Make sure you understand what to look out for before considering stem cell therapy. Remember most medical therapies are based on years of research that shows first in laboratory studies and then in clinical research that something is safe and will work. Like any new drug, stem cell therapies must be assessed and meet certain standards before receiving approval from national regulatory bodies to be used to treat people.”

The problem of “questionable” stem cell clinics has been growing over the past 5-10 years. Stem cell centers can be found in many countries around the world. Since they are outside the purview of the FDA, they can make all kinds of claims and offer stem cell treatments for fatal or incurable diseases like ALS, spinal cord injury, and even strokes. Targeting mostly affluent westerners, costs can easily exceed \$100,000.00. Look closely at the various internet ads for stem cell centers. You will most commonly find testimonials from patients who have had near miraculous responses. A logical question might be “Why not then publish your data and undergo rigorous peer review?” It is not unusual to find stem cell centers just over the border from modern medicine practiced here in the United States. Mexico is convenient for both medical staff and most patients. There are somewhere around 20 stem cell replacement clinics in Tijuana alone. Are they selling desperate patients a 21st century version snake oil? And just like it was with the bottle of snake oil, there will *always* be some patient who swears they got better from whatever ailed em in the first place by taking a couple of teaspoons of God –knows-what? You can read testimonial after testimonial on the websites of the replacement centers describing fantastic results. It would seem there is no better indication for Caveat Emptor.

My regular readers know that I will often check in with world authorities to get the most up to date information possible. I have recently communicated with a pulmonologist from the Netherlands who just finished attending the European Respiratory Society annual meeting in Munich. He told me that he was not aware of any stem cell research going on anywhere in Europe, and nothing was presented at the international conference. I also checked with three physicians at the National Jewish Hospital here in Denver. This included the medical director of the Interstitial Fibrosis program. None of these experts were aware of any stem cell research being done at National Jewish Hospital. This does not mean that some where within the academic community of the United States there isn't solid research happening as I type this out. Undoubtedly there are legitimate studies being done.

Stem cell therapy for lung disease is in its infancy. Theoretically it has the possibility of bringing great hope to many patients who have exhausted other forms of medical therapy to treat their lung disease. Often, the only option left on the table is lung transplantation with all the risks inherent therein. On paper, stem cell replacement therapy looks like it may be the next “BIG” thing. However, the biochemical, and technical bridges that need to be crossed are substantial. Do any of you reading this article remember when Fen-phen was the hottest

new diet pill? It was actually on the September 1996 cover of Time magazine. The same year it was placed on the market. Sales in that first year were \$300,000,000.00 as more than 18 million prescriptions were filled. If you know the whole story then you know that Fen-phen was pulled off the market in September 1997 by the FDA as there were at least 75 reports of Fen-phen induced heart injuries. Some patients had taken the drug for as little as a month and developed serious cardiac complications including the uniformly fatal Primary Pulmonary Hypertension (PPH).

Fen Phen and PPH



If indeed those who do not learn from mistakes of the past, are condemned to repeat them, let us heed the message so powerfully sent by the Fen-phen disaster. Stem cell research is so very promising in the possible treatment of so many diseases or chronic conditions. If you or a loved one is contemplating stem cell replacement therapy, spend the time investigating your particular situation. Make sure you meet and talk with your family physician, specialist, and certainly spend your time wisely in gathering your data. Perhaps in addition to obeying the rule of Caveat emptor, we should also be extra careful not to “put the cart too far ahead of the horse either.”

