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Tapping Into the Power of Your Own Stem Cells

Thursday 06 May 2010

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Stem cells have been at the center of some of the bitterest controversies as well as some of the most promising medical discoveries, and yet little has been done to help the nonscientist reader gain a clear understanding of what's really taking place in this field, what are the true promises, as well as the real problems. The short answer: the natural role of adult stem cells in the body is indeed one of the greatest medical discoveries of our times; it holds great promises for the future of healthcare, but on the other hand the problems have been largely manufactured for political reasons.

Stem cells are cells with the unique ability to multiply endlessly, or self-renew in the scientific jargon, and to transform themselves (differentiate) into cells of other tissues. No other cell type in the body has this ability. All the other cells of the body are specialized cells (somatic cells) whose purpose is to perform one specific task. For example, beta-cells of the pancreas make insulin, cells of the heart contract, cells of the retina respond to light, etc., and none of these cells have the ability to self-renew.

The ultimate stem cell is obviously the fertilized ovum, which is destined to become in the womb a complete human being, but many types of stem cells exist through the various stages of human development. The famous embryonic stem cells (ESC) that have been at the center of so much controversy are isolated from 8- to 10-day-old human embryos. At that stage, the embryo contains approximately 150 cells and is smaller than the tip of a needle.

Although very promising, still many problems remain before ESC can be used therapeutically on a large scale.

One such problem is the ethical problem associated with the use of ESC, which played a significant role in the 2004 elections. The case was made to the public that using ESC meant killing human beings that had the full right to live under our Constitution, and opposition to ESC research was used as a slogan to unite conservative forces. Aside from the fact that to begin with these embryos do not have the ability to live on their own without being implanted in a womb, the problem with this view is that the very human embryos used for research come from in vitro fertilization clinics, where surplus embryos are simply discarded in the trash if they are not used for research. So it is either death through disposal or death through laboratory procedures. Not one life is lost through ESC research that would not be lost anyway through simple disposal. Even for ultraconservatives and concerned Christians, it would seem to be a much greater honoring of human life to use such embryos for helping someone else rather than to simply throw them in the trash. So if we decide that killing human embryos is wrong, a very legitimate concern, then the center of attention should be in vitro fertilization, not stem cell research. And the main question should be whether we should allow creating human life in a lab to begin with. But attacking in vitro fertilization and call it unethical would mean to say that the roughly 48,000 babies born in vitro every year in the US are not ethical ... a political suicide. So the propaganda against ESC research went full force, completely misinforming the public to the point that still today many people think that ESC research means aborting fetuses and killing actual babies.

But the other obstacle to ESC research is the fact that although many breakthroughs have taken place, much scientific knowledge has been gathered, and many possible therapeutic applications have been developed, to this day no safe and effective treatment that can be offered on a large scale has been developed - one of the main problems being the significant propensity for ESC to lead to tumor formation. Nevertheless, it remains a promising field of research and there is still an important place in science for ESC research, as it is in the light of the knowledge pertaining to ESC that research on adult stem cells (ASC) has blossomed and continues to blossom.

ASC are stem cells present in any living organism. They are primarily located in the bone marrow, although many tissues harbor their own stem cells. Umbilical cord stem cells and placental stem cells are also considered ASC. ASC have been traditionally known for a long time for their role in the constant renewal of blood cells - red blood cells, white blood cells and platelets. But probably one of the most important discoveries of our times is the discovery that not only are ASC the precursors to blood cells, but they can also differentiate into virtually any cell type of the body. When placed in the presence of brain, liver or cardiac tissues, ASC will differentiate into functional cells of these tissues. (1)(2)(3) In fact, ASC literally constitute the natural repair system of the body. Whenever the body suffers an injury - heart attack, cut, stroke, a broken bone or even a chronic degenerative process - the affected area triggers the release of stem cells from the bone marrow and then attracts these stem cells to the affected tissue. (4)(5) Stem cells then migrate in the tissue and become cells of that tissue, literally repairing the tissue.(6) In this whole process, the number of circulating stem cells has been shown to be a critical factor; more stem cells circulating in the bloodstream means that more stem cells are available to migrate in tissues and participate to the process of tissue repair.(7)

From this followed the development of a number of clinical strategies tapping in the potential of ASC, all sharing a common thread. 1) Isolation of stem cells from a source. The source can be umbilical cord blood, placenta, one's own blood, one's skin or fat tissue, the dental pulp, or even animal sources such as bovine, sheep and even duck and fish. 2) The proliferation in laboratory of the stem cells that have been collected in order to increase their number before injection. 3) Exposure of the stem cells to mixtures of compounds or tissue extracts in order to initiate their differentiation into cells of a given tissue or lineage. This step, however, has been shown in recent studies not to be essential, as stem cells will go through the process of differentiation when they reach the target tissue. 4) Injection of stem cells in the bloodstream or in the organ needing repair.

Although none of these treatment protocols has been so far approved by the FDA, many have shown great promises and can be available in various clinics in various parts of the world. Nevertheless, in spite of their promises, they remain somewhat limited by poor availability of

stem cell sources (umbilical cord, placenta) and relatively high costs, and ultimately the safety of such treatments must be fully established.

A novel approach is emerging in the scientific literature that carries great promises. This approach, termed Endogenous Stem Cell Mobilization (ESCM), consists in simply supporting the natural release of stem cells from one's own bone marrow. By increasing the number of circulating stem cells, more cells are available to migrate in ailing tissues. This approach does not require the isolation of stem cells from any sources, and hence no risk of contamination or tumor formation, and its relatively low cost could allow broad application for various health conditions. This strategy could be coupled with procedures aimed at directing stem cells migration in specific organs such as the heart or the pancreas or the brain. The therapeutic potential of such an approach is the theme of a book I recently published called "Cracking the Stem Cell Code."

My interest in this field of research came through my scientific work over the past 15 years with an aquatic botanical called Aphanizomenon flos-aquae (AFA). Many people consuming this product as a dietary supplement reported interesting health benefits.(8) Being anecdotal and empirical, these reports did not have any scientific value, but they nonetheless remained compelling by their sheer number and the extent of some of these benefits. The most interesting or puzzling was in fact the wide variety of the reported benefits, touching various aspects of human physiology. How could one single plant bring such a wide variety of health benefits?

This remained a mystery until the summer of 2000 when a colleague of mine sent me an article describing how neurons containing the Y-chromosome had been found in the brain of mice that had undergone radiation therapy and had received a bone marrow transplant from a male donor. The presence of neurons with the Y-chromosome indicated that transplanted stem cells had migrated to the brain and differentiated into brain cells.(9) Soon after, similar observations were made in the heart and in the liver.(10) Our view was that if stem cells from the bone marrow had the ability of migrating in these tissues to become functional cells of these tissues,

then this could not simply be a random phenomenon without a purpose, it had to be part of what one could call the "natural repair system" of the body. And it could not be limited to only brain, heart and liver. So we published an article in the journal Medical Hypotheses (October 2002) in which we proposed that stem cells from the bone marrow constitute the natural repair or renewal system of the body.(11)

The reason why we were so interested in studying this phenomenon was that for the first time we had a possible explanation of how AFA could be working in the body. If stem cells from the bone marrow constitute the natural repair system of the body, then anything that would support the release of bone marrow stem cells should lead to a wide variety of benefits, as stem cells would migrate in different tissues in different individuals, and this is exactly what we had observed with AFA. So we hypothesized that the effect of AFA on the body was to support stem cell release from the bone marrow, increasing the number of circulating stem cells. So our starting point in the field of stem cell research, in late 2000, consisted of these two questions: 1) What if stem cells from the bone marrow constituted the natural repair system of the body? and 2) What if AFA worked by triggering the release of stem cells from the bone marrow?

The scientific data pertaining to the natural role of bone marrow stem cells in the body, establishing that indeed stem cells from the bone marrow constitute our natural repair system, is today overwhelming. Altogether the data come from dozens of scientific teams throughout the world, and can be found in hundreds of scientific articles. But this knowledge is so recent that until just a few years ago it remained impossible to find investors, as any scientist to whom they would send our dossier would respond by saying that our concept regarding the role of bone marrow stem cells was interesting, but nothing more than a fairy tale. And the fact that AFA was increasing the number of circulating stem cells probably had no physiological value. So we ended up doing all our scientific investigations on a very tight budget.

Through this scientific work, we demonstrated that indeed AFA contains a blocker of L-selectin, an adhesion molecule playing an important role in the maintenance of stem cells in the bone marrow.

The L-selectin blocker acts in the body by triggering the release of stem cells from the bone marrow, increasing the number of circulating stem cells by 30 percent within one hour of consumption. A concentrate from AFA has been developed and is being marketed as a dietary supplement under the name StemEnhance®.(12)

But from a scientific standpoint, aside from any commercial interest, StemEnhance remains first and foremost an extremely valuable scientific tool to investigate a novel approach in the field of ASC research. A significant amount of recent scientific literature suggests that simply supporting the release of stem cells from the bone marrow could constitute an effective approach in the treatment of various health conditions. However the compounds normally used in medicine to trigger stem cells release can carry significant side effects. The safety linked to the daily use of StemEnhance makes it a valuable tool to investigate the potential therapeutic effect of daily Endogenous Stem Cell Mobilization (ESCM).

But if there were one take-home message, I would say that it is the fact that all this novel information pertaining to the natural role of bone marrow stem cells in the body provides the foundation for a novel understanding of the process of aging and disease formation. Each organ and tissue renews itself over the course of a number of years, each tissue being different in turnover time, to the extent that during a normal lifetime we virtually renew our entire body a few times. Since most diseases result from the loss of a specific type of cells, i.e. insulin-producing cells in diabetes, dopamine-producing neurons in Parkinson's, cardiac cells in cardiomyopathy, etc., from this follows the principle that diseases are not so much the consequence of cellular loss but rather a deficiency or weakness in the process of tissue renewal. Health is an equilibrium between cellular loss and tissue renewal, and a disease develops in a tissue or an organ when the extent of cellular loss is such that the tissue or organ cannot function normally, and this can happen as a consequence of either excessive cellular loss or insufficient stem cell-based tissue repair. So far the main approach to anti-aging consists in reducing the rate of cellular loss by using antioxidants and other preventive measures. But understanding the role of stem cells from the bone marrow in replacing lost cells, provides for a novel way of maintaining health. If we can find ways to support the natural role

of stem cells in the body, we can then support the natural ability of the body to repair and renew itself.

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