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Sleep Deprivation And Its Effects On Precious Functional Stem Cells

Stem cells are mother cells that have the potential to become any type of cell in the body. One of the main characteristics of stem cells is their ability to self-renew or multiply while maintaining the potential to develop into other types of cells. Stem cells can become cells of the blood, heart, bones, skin, muscles, brain etc. There are different sources of stem cells but all types of stem cells have the similar capacity to develop into multiple types of cells. Scientists first studied the potential of stem cells in mouse embryos over two decades ago. Over years of research they discovered the properties of these stem cells in 1998. A stem cell transplant is a procedure that replaces defective or damaged cells in patients with healthy stem cells. Stem cell transplants commonly are used to treat leukemia and lymphoma, cancers that affect the blood and lymphatic system palliatively. They also can help patients recover from or better tolerate cancer treatment. In addition, these stem cell transplants are practiced to treat hereditary blood disorders, such as sickle cell anemia, and autoimmune diseases, such as multiple sclerosis. Many of the factors affecting the success of stem cell transplantations are still unknown. While stem cell transplantation is a standard therapeutic procedure for various malignant and non-malignant diseases, the impact of sleep on hematopoietic (blood) cell (HSCs) transplantation appears to be of common man's interest. Circadian rhythms provide temporal organization to molecular, cellular, and biochemical processes and they may therefore be synchronizing HSCs functions with sleep. A relationship of this nature between sleep and the function of HSCs can be especially important, as more than 100 million people around the world, including potential bone marrow donors, suffer from disorders of sleep and wakefulness. As sleep is a complex phenomenon, it is difficult to determine the factors that mediate the effects of sleep on the reconstitution potential of the stem cells. Sleep affects almost every physiological and behavioral system (metabolism, heart rate, endocrine system, immune system, etc.). It is therefore unlikely that a single factor mediates all the effects of sleep on the stem cells' viability, regenerative and reparative potential. In the current issue of Transcomm, we try to shed light on the effects of sleep or lack thereof on stem cells and their properties. We are sure the reader while appreciating the various uses of stem cells in modern medicine would realize the importance of incorporating ample amount of sleep in their daily life to maintain their overall health and wellbeing.

Future is shaped by your dreams while your health is shaped by your healthy stem cells !

So, stop wasting your time and go to sleep....

Sleep deprivation affects stem cells, reducing transplant efficiency

Although the research was done in mice, the findings have possible implications for bone marrow transplants, more properly called hematopoietic stem cell transplants, in humans. Drowsy mice make poor stem cell donors, according to a new study by researchers at the Stanford University School of Medicine. A sleep deficit of just four hours affects by as much as 50 percent the ability of stem cells of the blood and immune system to migrate to the proper spots in the bone marrow of recipient mice and churn out the cell types necessary to reconstitute a damaged immune system, the researchers found. Rolls, who is now an assistant professor at the Israel Institute of Technology, shares lead authorship of the study, which was published Oct. 14, 2015 in Nature Communications.

Hematopoietic stem cells, also known as blood stem cells, are responsible for giving rise to the cells of our blood and immune system and are the key "ingredient" in bone marrow transplants, a cellular therapy that was pioneered over 50 years ago. The transplantation of bone marrow or hematopoietic stem cells is now routinely used to treat patients with blood cancers such as leukemia or lymphoma and disorders of the immune system. According to the American Society for Blood and Marrow Transplantation, approximately 24,000 patients world-wide are annually transplanted with donor blood stem cells. There are many critical steps in a bone marrow or stem cell transplant between a donor and recipient (known as an allogenic transplant):

Bone marrow or stem cells from an immunologically matched donor are harvested. The recipient's immune system is "conditioned" to receive the donor cells. Transplanted donor stem cells migrate to the bone marrow - the vascular space inside the bone and home to hematopoietic stem cells.

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STEM CELLS IN FOCUS

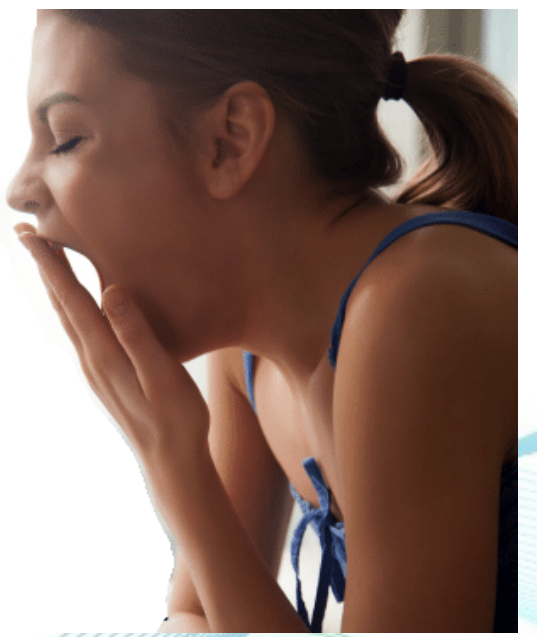
Stem Cells Need Sleep, Too

17 April, 2017

Sleep is that golden chain that ties health and our bodies together

-Thomas Dekker

Donor stem cells engraft in the recipient bone marrow and begin to proliferate to generate the cells that enter the circulation and help restore the patient's blood and immune system. Even a partial failure in one of these steps can threaten the success of the transplant. It turns out that sleep may also be a critical factor in transplant success. A team of scientists from California and Israel used mice to test the effect of sleep on stem cell transplantation. When mice were sleep-deprived, the ability of their stem cells to restore the blood and immune system of a recipient mouse was dramatically decreased. Not only were there fewer transplanted cells found in the circulation, but there were also fewer donor cells in the bone marrow of transplanted mice. How does sleep deprivation affect hematopoietic stem cell function? Part of the answer appears to be that the "sleepy cells" were functionally impaired (sound familiar?). Hematopoietic stem cells from the sleep-deprived mice were shown to have genetic changes that inhibited their migration. When these genetic changes were experimentally corrected, the "sleepy cells" were able to migrate normally thus demonstrating that the genetic changes were important for stem cell migration. Growth hormone may be another part of the answer. Known to be regulated by sleep, growth hormone was linked to the same genetic changes seen in the "sleepy" stem cells thus suggesting that growth hormone was the link between the lack of sleep and the genetic changes. We all know from our own experience that sleep is important, but how it affects cell function is a fundamental question and the subject of ongoing scientific inquiry. This research adds an important new and underappreciated dimension to stem cell research and their clinical use.



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