Environment Could Improve Stem Cell Therapies

Stem cell therapies are being hailed as a potential cure for many major health conditions, but there is much still to learn about the highly complex environments needed to optimize these therapies, according to researchers at the University of Adelaide.

For her Ph.D. in the University's School of Medicine, Sarah Hemming is studying the complex non-genetic factors (known as "epigenetics") that help to turn normal stem cells into bone-making cells.

Her research could eventually have application for patients suffering from bone cancers, osteoporosis, or even severe breaks that won't mend under any other circumstances, such as from motor vehicle accidents.

Hemming, who is also based in the Cancer Theme at the South Australian Health and Medical Research Institute (SAHMRI), has been investigating the role of epigenetic modifiers in the creation of bone-making cells since starting an honors degree with the University in 2011.

"Epigenetic modifiers are the proteins or signaling processes that have an important effect on our cells without altering the DNA," Hemming said. "Our genetic makeup is determined by our DNA, and this is widely known to have an impact on everything from eye color to health. However, it's really the epigenetic factors in combination with the underlying genetics that form the building blocks for all of the biology in our bodies. Cell survival, growth, regulation- all of these are affected in some way by epigenetics."

Non-genetic factors are critical in helping to push a normal stem cell towards the formation of a different kind of cell. In the case of Hemming's research, this means studying certain proteins that stimulate or inhibit the creation of bone-making cells, known as "osteoblasts."

"We know that there are rare conditions where the genes for certain proteins are mutated, resulting in developmental problems and abnormal bone growth. Previous research has found that the over expression of a protein can repress bone growth, and removing the protein promotes bone growth," Hemming said. "But it's not that simple. Epigenetic modifiers are a lot more complex and dynamic than we have given them credit for. Receiving an injection of stem cells to aid a person's condition is one thing. But being able to prime these cells to be more responsive and to develop in exactly the way we want them to, with the perfect environment, means that epigenetics is going to become much more important to stem cell therapies in the future."

Source: University of Adelaide [1]

Links:
[1] http://www.adelaide.edu.au/news/news74102.html