GEN News Highlights

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Right Stem Cell Tools for Joint-Improvement Jobs

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The stem cell toolbox has been a bit of a jumble, at least as far as joint-improvement projects are concerned. Scattered among bone marrow stromal cells (BMSCs) are stem cells that could be useful in treating arthritis—regenerating tissue, cartilage, and bone—but grabbing hold of them is difficult. BMSCs tend to look alike, even though some are capable of differentiation and some are not. Consequently, cell-based arthritis treatments have involved a degree of blind groping.

Arthritis treatments promise to become handier now that researchers at the University of York have demonstrated that different kinds of BMSCs can be identified and isolated from each other. Most important, these researchers have shown how to identify which BMSCs are stem cells capable of repairing cartilage of joint tissue, advancing the development of cell-based treatments against arthritis.

The York team presented its findings June 9 in Stem Cell Reports, in an article entitled, "Multiparameter Analysis of Human Bone Marrow Stromal Cells Identifies Distinct Immunomodulatory and Differentiation-Competent Subtypes." This article described how the researchers used immortalized human BMSC clonal lines for multilevel analysis of functional markers for BMSC subsets.

"All clones expressed typical BMSC cell-surface antigens," wrote the authors. "[However], clones with trilineage differentiation capacity exhibited enhanced vascular interaction gene sets, whereas non-differentiating clones were uniquely CD317 positive with significantly enriched immunomodulatory transcriptional networks and high IL-7 production."

Essentially, the York team showed that distinct functional identities can be assigned to BMSC subpopulations, including those likely to have specific roles in bone homeostasis. In addition, the team isolated a rare subset of stem cells in bone marrow. These cells have no capability for tissue repair. Instead, they appear to participate in immune function.
"While stem cell therapy is an exciting new development for the treatment for osteoarthritis, up to now it has been something of a lottery because we did not know the precise properties of each of the cells," said Paul Genever, Ph.D., the leader of the York team. "This project has helped us to establish which cells are good at regenerating tissue, cartilage, and bone, respectively. It will help in the search to develop more targeted therapies for arthritis patients."

爲關節治療提供更正確的幹細胞工具

曹伯年副教授/陳弘觀助理

幹細胞作為一種治療工具一直以來都是一個有點混亂的狀況，以關節治療為例，骨髓間葉細胞(**bone marrow stromal cell, BMSCs**)雖然被認定具有治療關節炎的潛力----它可以在生組織、軟骨、硬骨。但是有效分離具有治療效果的細胞卻是困難重重。ＢＭＳＣs中包含具備分化能力，具有療效的幹細胞，以即並不具備分化能力的一般間葉細胞。這些不同的BMSCs在形態與行為表現上都很相似。顯然地，以BMSCs為基礎的關節炎治療就會有點像是抽樂透一樣無法保證療效。

這個困境被紐約大學的團隊所突破，在今年六月份的**Stem cell reports**，該團隊發表了一篇報告，指出他們有能力辨認以及分離不同的**BMSCs**，更重要的是，他們也確認了哪一個類型的**BMSCS**具有再生關節軟骨的能力，把在細胞療法的領域，為關節炎的治療帶來突破。

這篇報告標題為”人類骨髓間葉細胞多變數分析分辨不同免疫調節及可分化亞型”。內容描述研究者使用**BMSC**細胞株進行分子標靶的多階層分析。顯示所有的**BMSCs**都表現標準**BMSCs**的分子標靶，然而，具有三個胚層分化能力的**BMSCs**具有更高的血管互動基因組合，而不具被分化能力的細胞株則特定表現**CD317**，以及顯著提升的免疫調節基因和高表現的**IL-7**。

簡而言之，紐約的團隊證明了不同功能的**BMSC**的亞族群**(sub population)**，當中包括了可能在骨質恆定中扮演關鍵角色的族群。並且，該團隊分離了一個罕見的亞族群，雖然不具備組織再生的能力，卻展現了調節免疫的功能。

該團隊的領導者，**Paul Genever**博士表示“對骨關節炎而言，在幹細胞療法還是一個令人刺激新領域的時候，我們依舊不了解各別細胞的精確特質，這使得整個治療像是大樂透一樣。” 這個計畫幫助我們建立能夠分別再生組織、軟骨、硬骨的個別亞型，因此對於將來朝向更精準的治療是大有幫助。