

Researchers distinguish subcutaneous from visceral fat stem cells using specific cell markers

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Scientists from A*STAR's Singapore Bioimaging Consortium (SBIC) led in the discovery that two little-known fat cell markers have huge potential to assist researchers to further their understanding of fats. The discovery was recently published in prestigious science journal, *Stem Cell Reports*.

Adipose or fat cells are essential for proper body function. Yet, being too fat is detrimental to your health and raises risk of developing metabolic diseases like diabetes, heart disease and hypertension. With worldwide obesity nearly doubling since 1980, there is an urgent need for research into the science of diseases caused by obesity.

Fat stem cells are "young" cells that mature into fully functioning fat cells. The research team looked at two different fat stem cells types: [subcutaneous fat](#) found beneath the skin and visceral fat surrounding internal organs. The researchers are able for the first time to tell apart subcutaneous from visceral fat stem cells using specific cell markers.

The researchers looked at 240 different markers present on the surface of fat stem cells and discovered two markers called CD10 and CD200. An imaging technique called High-Content Screening (HCS) was used to spot these markers individually by latching them with fluorescence tags. What the scientists found was subcutaneous fat contained more CD10 signals while visceral fat exhibited more CD200. By using the different

composition of CD10 and CD200 on fat stem cell surface, scientists can use these marking signatures to differentiate subcutaneous from visceral fat.

It is already known that subcutaneous fat and visceral fat have different capabilities at storing excess lipids. Subcutaneous fat cells are able to effectively store excess lipids and keep them from leaking into other organs. However, visceral fat is less efficient at storing fat resulting in excess lipids entering the blood and other organs. Abnormally high levels of free lipids circulating in the body lead to inflammation, high blood pressure, diabetes and coronary plaque formation - a major cause of heart attack and stroke. The researchers view the difference in fat cells' ability to store lipids as "high-quality" in subcutaneous fat and "low-quality" in visceral fat. Professor Shigeki Sugii who heads the study discovered another use of the CD10 and CD200 markers; that they can be used to predict the quality of fat cells. Studies done in culture dishes show that fat [stem cells](#) with high CD10 / low CD200 mature into high-quality fat cells, while [fat stem cells](#) with low CD10 / high CD200 mature into low-quality fat cells.

Prof Sugii who is also the lead scientist at SBIC's Fat Metabolism and Stem Cell Group said, "Markers CD10 and CD200 will be a useful tool for visualising stem cell populations of distinct adipose tissue. Scientists can now diagnose the quality of individual [fat cells](#) from healthy or diseased people."

It will be beneficial for human health if there were treatments available that could turn vicious, low-quality visceral fat into high-quality subcutaneous fat. Using the method developed by SBIC, identification of [fat](#) stem cell types and their quality can be performed within two or three days, compared to the current two weeks. Prof Sugii's method paves the way for scientists to speed up their high-throughput drug screenings for potential drugs targets to treat metabolic diseases caused

by [visceral fat](#).

More information: "Identification of Specific Cell-Surface Markers of Adipose-Derived Stem Cells from Subcutaneous and Visceral Fat Depots." Wee Kiat Ong, Chuen Seng Tan, Kai Li Chan, Grace Gandhi Goesantoso, Xin Hui Derryn Chan, Edmund Chan, Jocelyn Yin, Chia Rou Yeo, Chin Meng Khoo, Jimmy Bok Yan So, Asim Shabbir, Sue-Anne Toh, Weiping Han, Shigeki Sugii *Stem Cell Reports*, Volume 2, Issue 2, 171-179, 06. [DOI: 10.1016/j.stemcr.2014.01.002](https://doi.org/10.1016/j.stemcr.2014.01.002)

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