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New discovery on how skin cells form 'bridges' paves the way for advances in wound healing

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A team of researchers from the National University of Singapore (NUS) have discovered that outer skin cells are able to unite to form suspended "bridges" during wound healing. The new findings will pave the way for tissue engineering, such as the design of artificial skin, and better wound treatment.

Led by Professor Lim Chwee Teck from the Mechanobiology Institute (MBI) at NUS and Departments of Biomedical Engineering and Mechanical Engineering at the NUS Faculty of Engineering, and Professor Benoit Ladoux from MBI and Institut Jacques Monod, the scientists discovered how skin cells can migrate over regions devoid of support from the extracellular matrix, which are structural proteins that allow cells to adhere to. These research findings were first published online in the leading scientific journal *Nature Materials* on 2 December 2013.

How human outer skin cells form suspended multicellular "bridges"

Using microfabricated technology, the team found that layers of human outer skin cells, known as keratinocytes, are able to form suspended multicellular "bridges" over regions devoid of extracellular matrix support. Migrating keratinocytes are able to move forward as a united and homogenous collection of cells to form a protective barrier over a

wounded area. Eventually, these cells come together to form suspended "bridges" over regions which are not conducive for cell adhesion. It was previously not understood how this healing process, known as "re-epithelialization", could occur over a wound bed that did not provide a homogeneous coating of extracellular matrix for cells to migrate on.

The researchers also found out that the suspended cell sheet is created through the build-up of large-scale tension activated by acto-myosin, a kind of motor protein that can cause contraction in cells. They found the cell sheet to be elastic-like in behavior, which partly explained its ability to form multicellular bridges. This is not seen in other cell types which tend to be more fluid-like.

Next steps in tissue mechanobiology research

Commenting on their study, Prof Lim said, "We need to conduct an in-depth study of the various factors regulating wound healing so that we can better understand the process of tissue repair and regeneration. Our study will hopefully pave the way for designing better alternatives that can overcome the current limitations in the field of skin tissue engineering and promote satisfactory skin regeneration. Some potential applications include treating skin burn wounds as well as characterising the mechanical properties of cell sheets."

Moving forward, the team will continue to push the boundary of tissue mechanobiology research by investigating the physical and mechanical properties of skin cells. This research will enable scientists to have a better understanding of the changes associated with certain skin diseases such as blistering diseases and those that occur during the course of ageing.

Provided by National University of Singapore

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