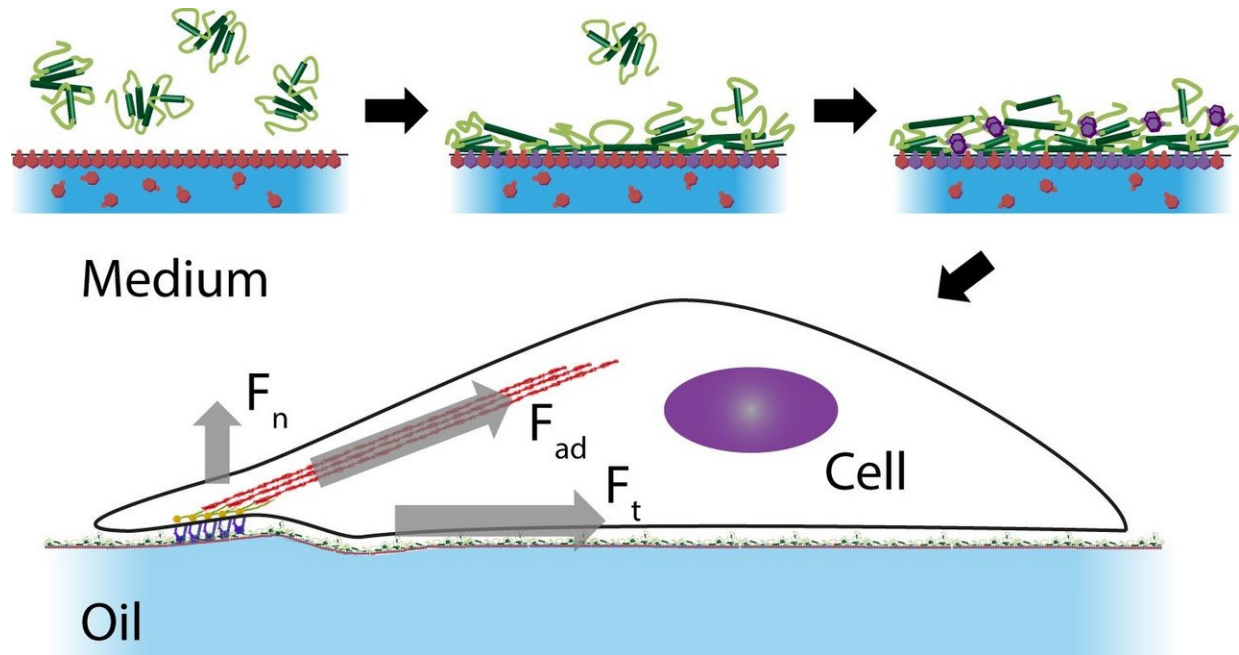


Cells 'walk' on liquids a bit like geckos

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Protein nanosheet assembly displaying strong mechanical properties allow cell adhesion and proliferation at the surface of liquids. Credit: Julien Gautrot

Researchers at Queen Mary University of London have discovered that cells can 'walk' on liquids a bit like the way geckos stick to other surfaces.

Cells are typically grown on solid materials, such as tissue culture plastic, degradable polymers and bioceramics. It is thought that the strong mechanical properties of these biomaterials are required to allow [cell](#)

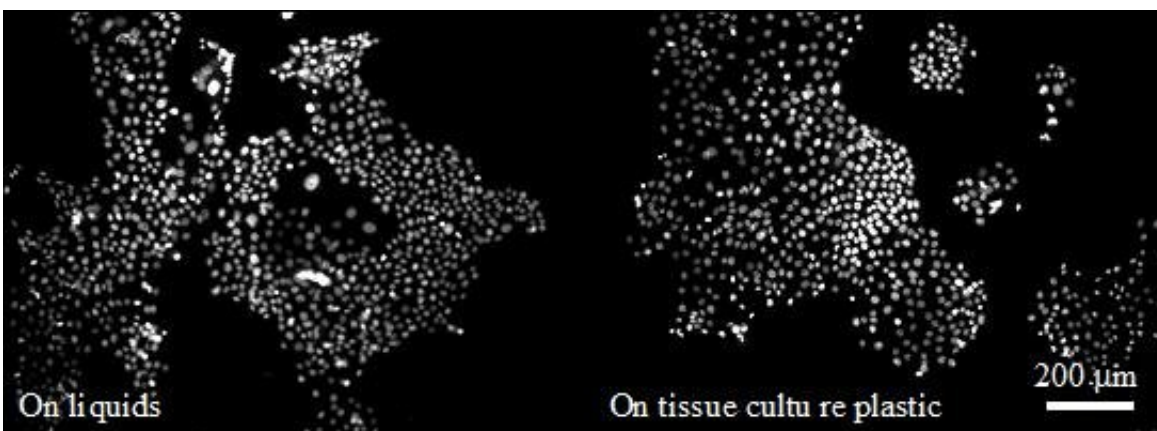
[adhesion](#), an important process often controlling the behaviour of [stem cells](#) and promoting implant incorporation by surrounding tissues and tissue regeneration.

In this study, published in *Nano Letters*, the researchers report the successful growth of skin cells at the surface of liquid oil droplets.

This is surprising as the low viscosity of liquids is not thought to support the mechanical forces generated by cells during their adhesion.

The research team discovered that protein nanosheets, films only a few nanometres thick, assemble at the surface of such liquids and display strong mechanical properties sufficient to resist cell-generated forces.

By combining different types of mechanical characterisation methods at the nanoscale, they propose that cell adhesion to such liquids is not mediated by surface tension, as in the case of the walking of water striders, but more akin to the adhesion of geckos to a wide range of surfaces, in which shear forces play an important role.



Epidermal cell colonies grown on liquids (left) and tissue culture plastic classically used for cell culture (right). Credit: Julien Gautrot

Lead author Dr Julien Gautrot, from Queen Mary's School of Engineering and Materials Science, said: "Understanding the mechanisms responsible for this behaviour is important as it suggests that the nanoscale properties, rather than their bulk properties, controls cell [adhesion](#) and potentially other cell behaviour. This will have important implications for the design of a [new generation](#) of biomaterials for regenerative medicine and tissue engineering."

He added: "This means that [nanoscale properties](#) of biomaterials or tissue engineering scaffolds can be engineered independently of bulk properties to control cell phenotype and scaffold mechanics separately."

Liquid-liquid systems, such as emulsions like a vinaigrette, are particularly advantageous to a wide range of processing and technologies. They are often used in chemical synthesis and chemical engineering where they have revolutionised industrial processes. In contrast, cell culture and stem cell technologies have not benefitted from the flexibility of liquid-liquid systems.

The team suggest the study could lead to the design of a new generation of cell technologies, for the improved production of adherent stem [cells](#) for [regenerative medicine](#).

More information: Dexu Kong et al, Protein Nanosheet Mechanics Controls Cell Adhesion and Expansion on Low-Viscosity Liquids, *Nano Letters* (2018). [DOI: 10.1021/acs.nanolett.7b05339](https://doi.org/10.1021/acs.nanolett.7b05339)

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