

Hair-like constructs offer drug screening platform

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Scientists from A*STAR have successfully engineered cellular structures resembling hair follicles in the laboratory—a tool that can now be used to develop new therapies to promote or decrease hair growth.

"The follicle-like structures of our model form the basis of a promising

assay for screening hair drugs," says study author Andrew Wan, a team leader and principal research scientist at the A*STAR Institute of Bioengineering and Nanotechnology (IBN) in Singapore.

Mature hair follicles are elaborate three-dimensional, bulb-shaped structures, and hair fibers consist of multiple layers of a structural protein known as keratin. Keratin is produced in response to signals from a regenerating organ found below the surface of the skin at the base of the fiber called the dermal papilla (DP). The DP brings nutrients and oxygen to the fiber cells; it also responds to hormones that regulate [hair follicle](#) development and cycling.

To mimic this structure, a team led by Wan and Jackie Y. Ying, the executive director of IBN, combined human keratin-producing keratinocytes with human DP cells in a hydrogel scaffold that allows cells to be cultured and segregated in spatially defined regions. The DP cells subsequently formed small spheroidal clumps, partially surrounded by keratinocytes—a configuration similar to that found at the root of native hair follicles.

The researchers characterized the gene expression profile of the DP cells in this three-dimensional architecture. They found increased levels for those genes involved in hair-associated interactions with the keratinocytes. In addition, they tested the hair inductive potential of the lab-grown follicles by implanting four-day-old cell structures below the skin of mice. Under the microscope, they could see hair follicle-like growths forming around three to four weeks later.

Having demonstrated the hair follicle-like nature of the assemblages, Wan and Ying's group next investigated the suitability of these cell constructs for testing hair drugs. As a proof of principle, they added drugs with known effects on [hair growth](#)—the promoter hepatocyte growth factor (HGF) or the inhibitor transforming growth factor- β 2

(TGF- β 2).

Based on the consistency of their results with drugs of known effects, Ying suggests that the laboratory-grown follicles could now be used to search for compounds with hitherto unknown effects on hair development. "Such technology would facilitate the discovery of drugs for promotion or inhibition of [hair](#) growth, which are problems affecting many people worldwide," she says.

More information: Lim, T. et al. Follicular dermal papilla structures by organization of epithelial and mesenchymal cells in interfacial polyelectrolyte complex fibers, *Biomaterials* 34, 7064–7072 (2013).
[dx.doi.org/10.1016/j.biomaterials.2013.05.068](https://doi.org/10.1016/j.biomaterials.2013.05.068)

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