

3-D printing breakthrough heralds new era for advanced skin models

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Scientists in South Korea have come up with a new method for 3-D printing human skin, which both shortens the process and reduces the cost.

Reporting their results today in the journal *Biofabrication*, the team from Pohang University of Science and Technology demonstrate a new 3-D cell printing strategy, for engineering a 3-D human [skin](#) model in a single step process.

Lead author Professor Dong-Woo Cho, from the university's department of mechanical engineering, said: "Although several approaches have been explored for developing biomimetic human skin models, the present skin models, which are still based on multistep production methods using polydimethylsiloxane (PDMS) chips and commercial cell culture inserts, could be limited in making a versatile design that facilitates the development of various functional human skin models. In this regard, 3-D cell-printing technique could establish a new era for advanced skin models."

The researchers developed a hybrid 3-D cell-printing system, which allows for the use of extrusion and inkjet modules on the printer at the same time. By using the printer's extrusion-dispensing module, they engineered a collagen-based material with a polycaprolactone (PCL) membrane.

Professor Cho said: "PCL is a biodegradable polyester that prevents

collagen's contraction during tissue maturation. Meanwhile, we used the inkjet-based dispensing module to uniformly distribute keratinocytes – the predominant cell type in the outermost layer of the skin – onto the engineered skin."

Notably, the skin model developed by the team included a supportive 3-D construct all in a single process, enabling the maturation of the skin model without the use of commercial cell culture inserts.

The skin [model](#) also displayed good biological characteristics, including a stabilised/fibroblast-stretched dermis, and stratified epidermis layers after 14 days.

Professor Cho said: "Significantly, our new [method](#) is around 50 times cheaper than alternative methods, and requires 10 times less base material.

"We hope that this new single-step process could provide an attractive and useful platform for engineering fully functional [human skin](#) models."

More information: Byoung Soo Kim et al. Direct 3D cell-printing of human skin with functional transwell system, *Biofabrication* (2017).

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