Researchers develop hybrid scaffold, potential for future skin tissue engineering

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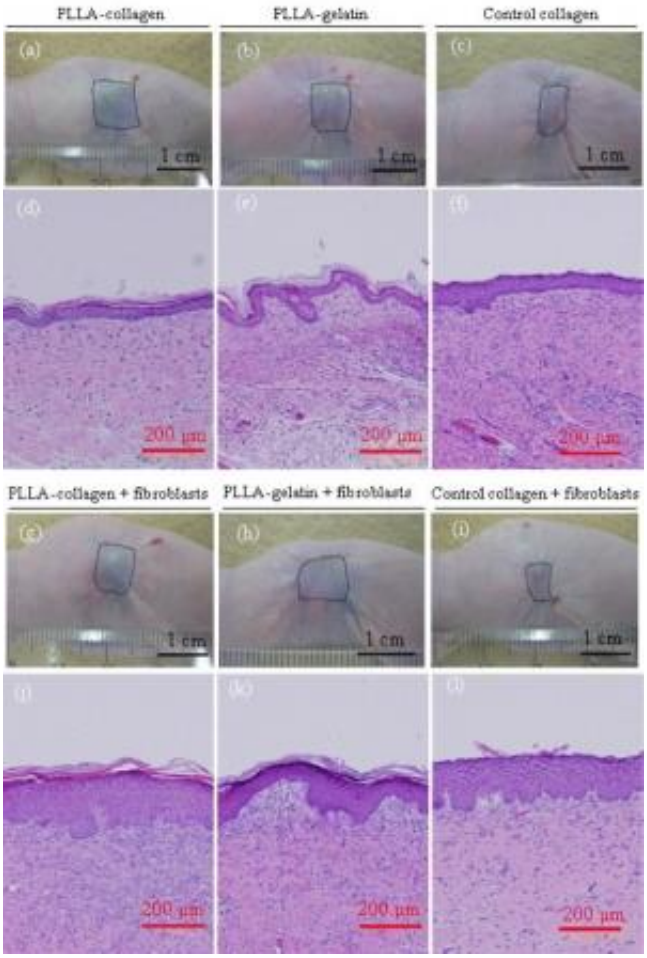
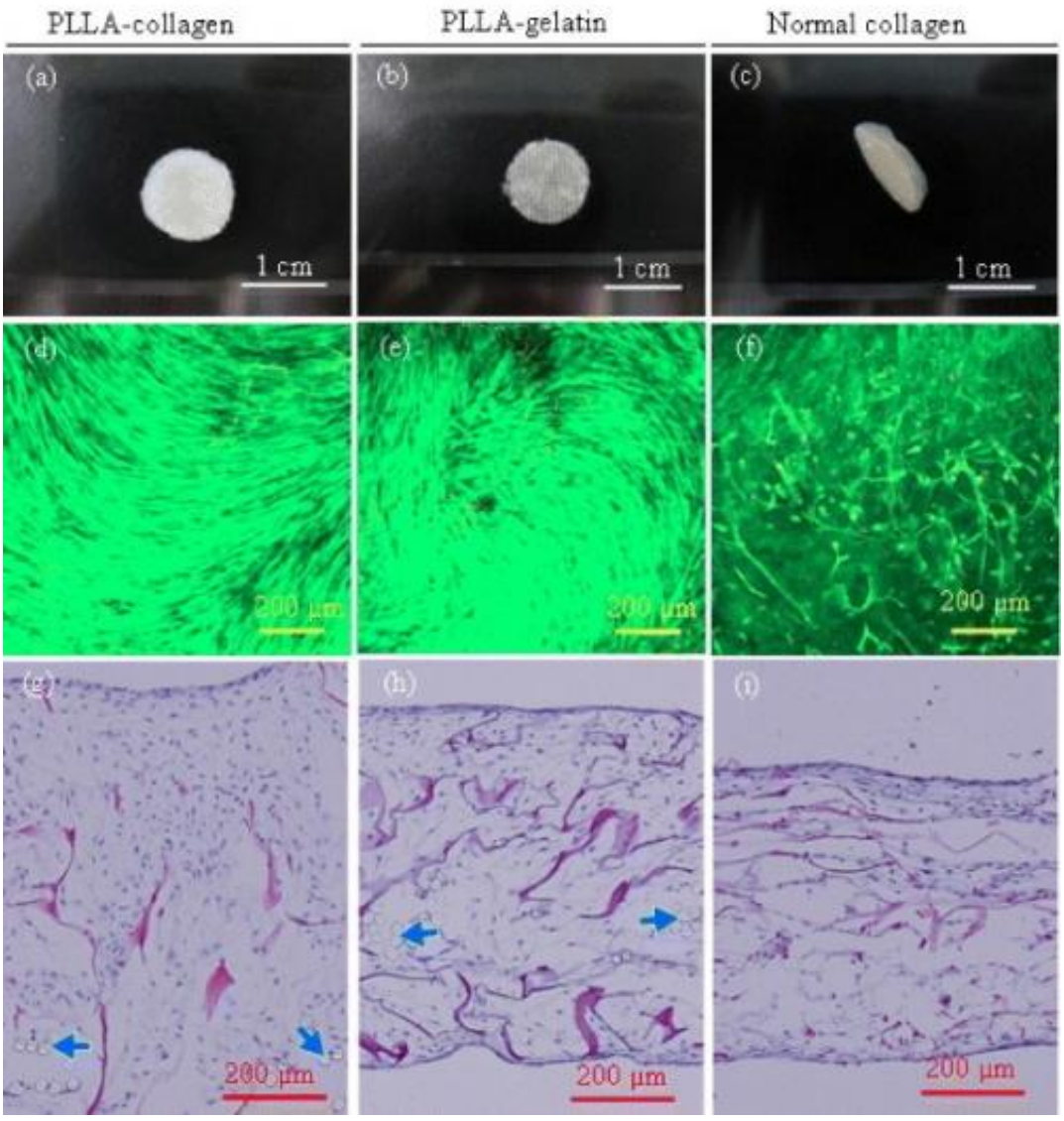


Gross appearance of the wound closure in athymic nude mice (a–c and g–i) and histological photomicrographs of skin biopsies (d–f and j–l) 4 weeks after implantation. Scale bars represent 1 cm in (a–c, g–i) and 200 μm (d–f, j–l). Wound areas are traced with the dotted rectangles.

Researchers in Japan have created a hybrid scaffold which promotes regeneration of skin in live animals while maintaining mechanical strength making it a promising material for future skin tissue engineering. This research was recently published in the *Science and Technology of Advanced Materials*.

Open skin wounds need to be repaired quickly to prevent infection. Using artificial skin substitutes for repair avoids the difficulties of grafts, but an ideal material for a scaffold that's strong and allows regeneration of skin tissue has yet to be found.



Gross appearance (a–c), cell viability (d–f) and HE staining photomicrographs (g–i) of cell/scaffold constructs after 1 week culture in vitro. Cell viability was evaluated via live/dead staining and observed by fluorescence microscopy. Arrows indicate PLLA fibers. Scale bars: 1 cm in (a–c) and 200 μm in (d–i).

Some current scaffolds are made of collagen or gelatin, which are ideal for promoting tissue regeneration but are not mechanically strong. Others are made of biodegradable synthetic materials such as Poly(L-lactic acid) (PLLA); these are stronger, but not so good for tissue growth. Guopong Chen and colleagues at the National Institute for Materials Science, Japan, have created a hybrid scaffold that has all the necessary properties.

The team had previously formed 'funnel-like' scaffolds with pores that are interconnected under the surface, allowing cells to grow into the scaffold. Now, they have formed these funnel-like collagen or gelatin 'sponges' on a PLLA mesh to create hybrid scaffolds.

Figure 2 from Hongxu Lu et al

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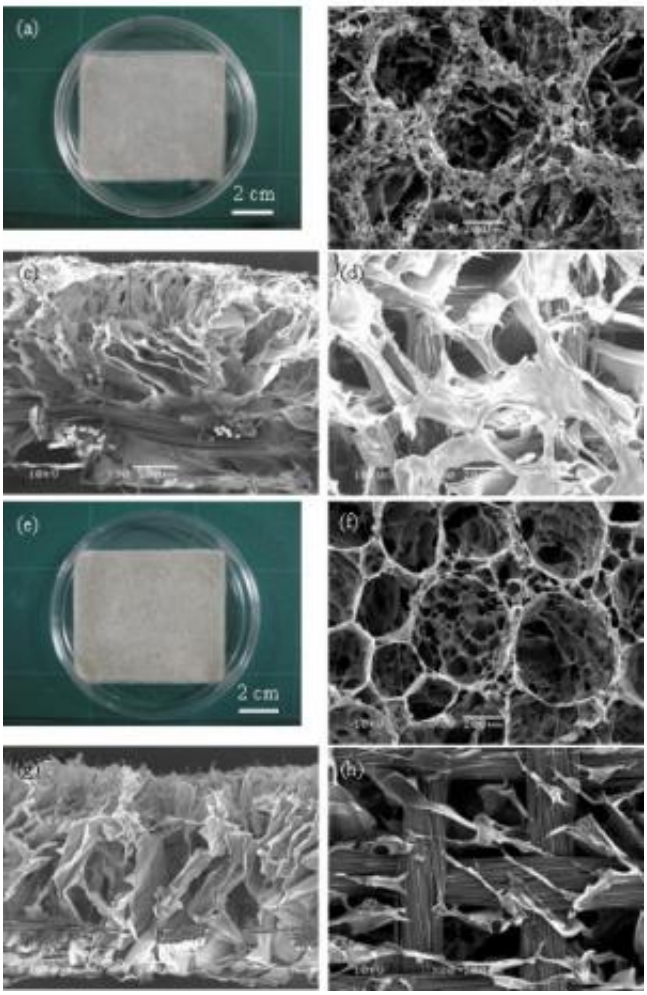

Funnel-like PLLA-collagen (a-d) and PLLA-gelatin (e-h) hybrid scaffolds: gross appearance (a, e) and SEM images of the top surfaces (b, f), cross-section (c, g), and bottom surface (d, i). Scale bars: a, e: 2 cm; b-d, f-h: 200 μm.

Connective tissue cells grew on the hybrid scaffold and penetrated into the pores, with more cells growing in the hybrid scaffold than in a scaffold made only of collagen. Implantation of the hybrid scaffolds into the backs of mice also promoted healing: four weeks after implantation, skin defects were completely closed. Regenerated skin was healthier

with the hybrid scaffold than with a collagen-only scaffold, and there was also less deformation of the skin due to the extra strength provided by the PLLA mesh.

The ability of the hybrid scaffold to promote regeneration of skin in live animals while maintaining mechanical strength makes it a promising material for future skin tissue engineering.

More information: Hongxu Lu, Hwan Hee Oh, Naoki Kawazoe, Kozo Yamagishi and Guoping Chen (2012) PLLA-collagen and PLLA-gelatin hybrid scaffolds with funnel-like porous structure for skin tissue engineering. *Science and Technology of Advanced Materials* Vol. 13 (2012) p. 064210. doi:10.1088/1468-6996/13/6/064210. iopscience.iop.org/1468-6996/13/6/064210

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