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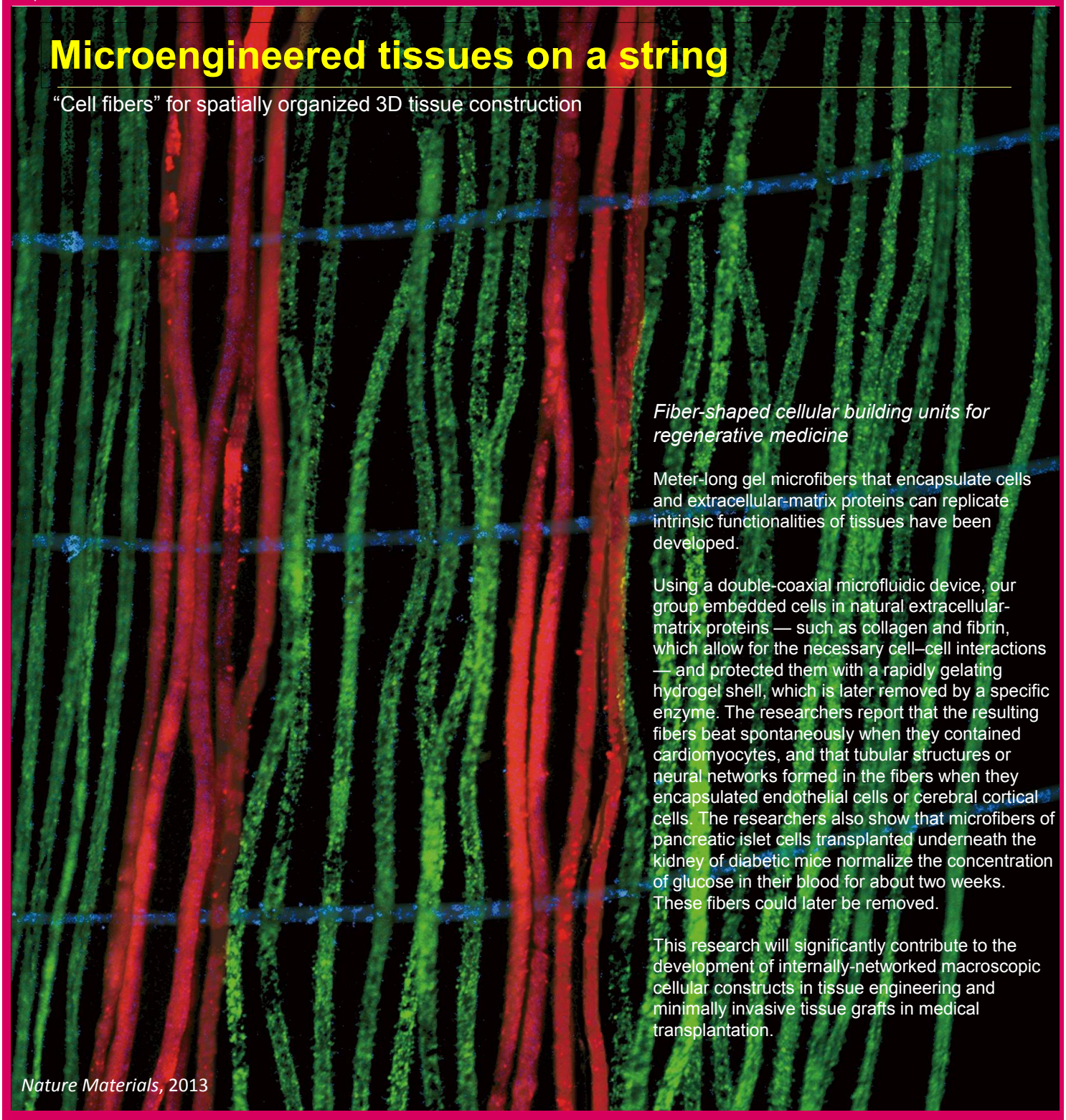
Microengineered tissues on a string

"Cell fibers" for spatially organized 3D tissue construction



Fiber-shaped cellular building units for regenerative medicine

Meter-long gel microfibers that encapsulate cells and extracellular-matrix proteins can replicate intrinsic functionalities of tissues have been developed.

Using a double-coaxial microfluidic device, our group embedded cells in natural extracellular-matrix proteins — such as collagen and fibrin, which allow for the necessary cell–cell interactions — and protected them with a rapidly gelating hydrogel shell, which is later removed by a specific enzyme. The researchers report that the resulting fibers beat spontaneously when they contained cardiomyocytes, and that tubular structures or neural networks formed in the fibers when they encapsulated endothelial cells or cerebral cortical cells. The researchers also show that microfibers of pancreatic islet cells transplanted underneath the kidney of diabetic mice normalize the concentration of glucose in their blood for about two weeks. These fibers could later be removed.

This research will significantly contribute to the development of internally-networked macroscopic cellular constructs in tissue engineering and minimally invasive tissue grafts in medical transplantation.

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