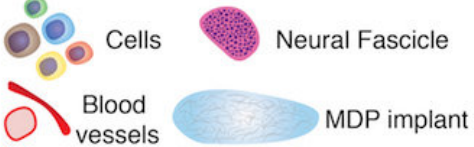
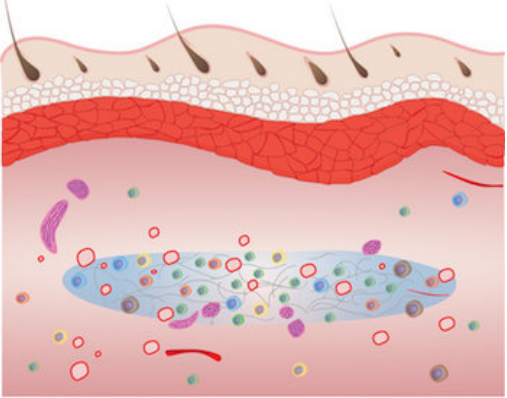
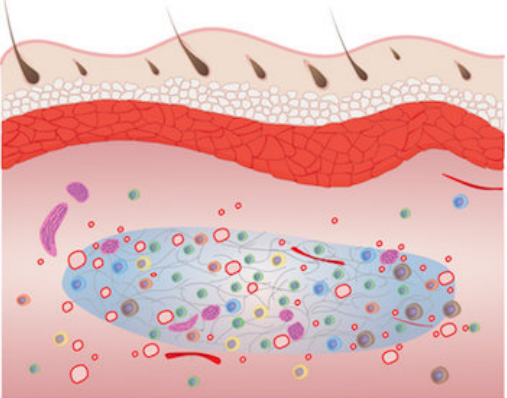
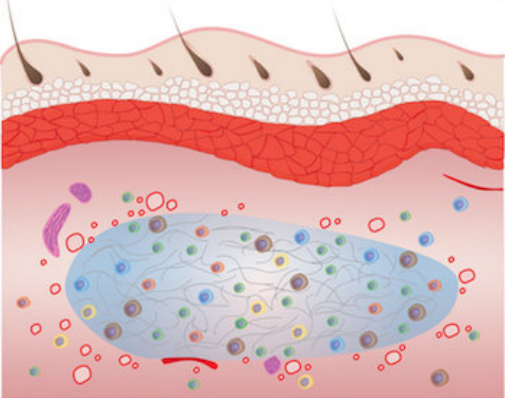
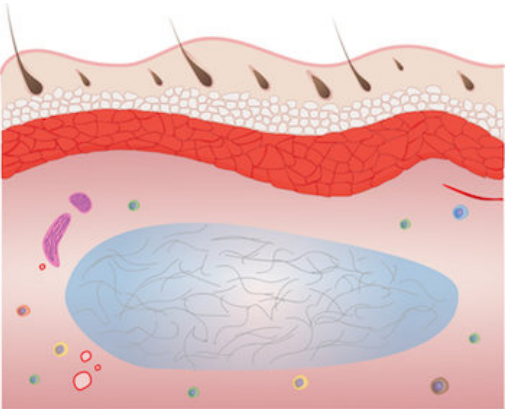


Hydrogel heals without additives

March 13 2018, by Mike Williams



An illustration shows how over six weeks, from top to bottom, a hydrogel developed at Rice University aids tissue remodeling. The process begins with cell infiltration followed by vascularization, innervation and slow degradation of the hydrogel as it is replaced by healthy tissue. Credit: Hartgerink Research Group

Sometimes when you're invested in a project you fail to notice things that turn out to be significant.

Researchers in the Rice lab of chemist and bioengineer Jeffrey Hartgerink had just such an experience with the hydrogels they developed as a synthetic scaffold to deliver drugs and encourage the growth of cells and blood vessels for new tissue.

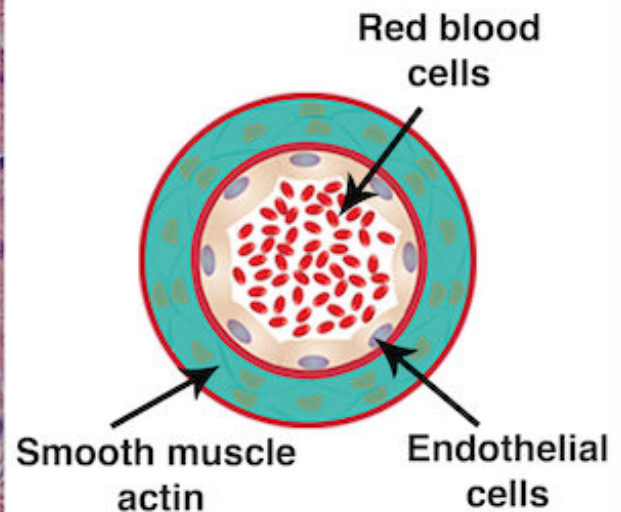
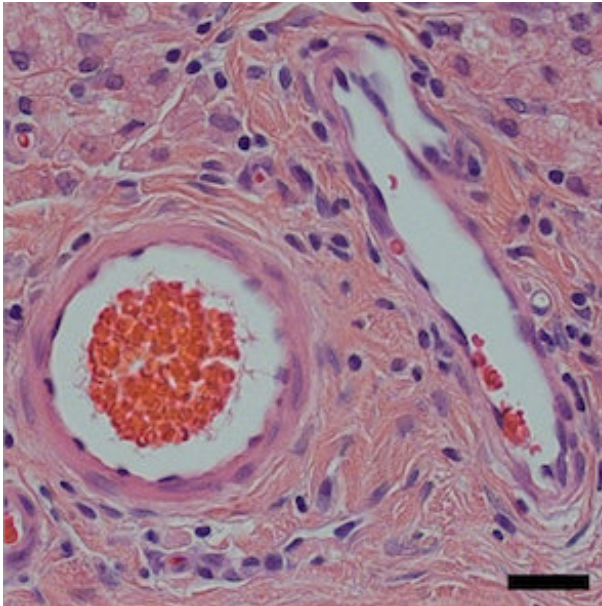
To do so, they often tested the gels by infusing them before injection with bioactive small molecules, cells or proteins. What they didn't realize until recently was that the [hydrogel](#) itself has significant therapeutic qualities.

The lab reported in the Elsevier journal *Biomaterials* that a particular hydrogel, a self-assembling multidomain peptide (MDP) with the [amino acid sequence](#) K2(SL)6K2, is indeed bioactive.

Once Hartgerink and his team started to investigate the phenomenon, they found that even without additives their MDP is rapidly infiltrated by host cells, provokes a temporary inflammatory [response](#), does not develop a fibrous capsule, supports the infiltration of a mature vascular network and recruits nerve fibers.

"We were surprised to find this strong effect in what we had previously

considered to be a control peptide," Hartgerink said. "As it turned out, the inherent structure and chemistry of this peptide, despite being quite simple, results in a strong biological response."



Tests showed that subcutaneous implants, left, of a hydrogel developed at Rice University encouraged blood vessel and cell growth as new tissue replaced the degrading gel. Credit: Hartgerink Research Group

The hydrogel, which can be delivered through a syringe, is designed to degrade over six weeks and leave behind healthy tissue. Because the [peptides](#) are designed from the bottom up to mimic their natural counterparts, the lab found they create an optimal environment for the body's own systems to encourage healing.

The researchers reported the natural inflammatory response when a foreign substance like a hydrogel is introduced into a system and draws cells that secrete proteins involved in cellular infiltration, scaffold

degradation, vascularization and innervation. Tests on injected hydrogel showed a "statistically significant" increase in the presence of cytokines known to provoke an [inflammatory response](#), as well as an increase in anti-inflammatory agents, both of which remained steady after day three and through two weeks.

That, Hartgerink said, indicates the hydrogel appears to harness the body's innate capacity to heal as it transitions from a pro-inflammatory to a pro-healing environment.

"As we eventually discovered, this exceptional peptide allows the body to carry out healing on its own, but with a significant boost," he said.

"We believe the key step is the initial, and very rapid, cell infiltration. Once these [cells](#) are on location, they produce everything they need for an impressive regenerative response, including angiogenesis and neurogenesis."

Hartgerink said the lab is pursuing application of the peptide for wound-healing in diabetic ulcers.

More information: Amanda N. Moore et al. Nanofibrous peptide hydrogel elicits angiogenesis and neurogenesis without drugs, proteins, or cells, *Biomaterials* (2018). [DOI: 10.1016/j.biomaterials.2018.01.033](https://doi.org/10.1016/j.biomaterials.2018.01.033)

Provided by Rice University

Citation: Hydrogel heals without additives (2018, March 13) retrieved 26 April 2024 from <https://phys.org/news/2018-03-hydrogel-additives.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is

provided for information purposes only.