Hydrogel

Hydrogel products constitute a group of polymeric materials, the hydrophilic structure of which renders them capable of holding large amounts of water in their three-dimensional networks. Extensive employment of these products in a number of industrial and environmental areas of application is considered to be of prime importance. As expected, natural hydrogels were gradually replaced by synthetic types due to their higher water absorption capacity, long service life, and wide varieties of raw chemical resources. Literature on this subject was found to be expanding, especially in the scientific areas of research. However, a number of publications and technical reports dealing with hydrogel products from the engineering points of view were examined to overview technological aspects covering this growing multidisciplinary field of research [1].

Although injectable hydrogels show promise for promoting healing of lesions and health of surrounding tissue, enabling cellular ingrowth and restoring neural tissue continue to be challenging. Hu et al. hypothesized that these challenges arise in part from the mismatch of composition, stiffness and viscoelasticity between the hydrogel and the brain parenchyma, and tested this hypothesis by developing and evaluating a self-healing hydrogel that not only mimicked the composition, but also the stiffness and viscoelasticity of native brain parenchyma. The hydrogel was crosslinked by dynamic boronate ester bonds between phenylboronic acid grafted hyaluronic acid (HA-PBA) and dopamine grafted gelatin (Gel-Dopa). This HA-PBA/Gel-Dopa hydrogel could be injected into a lesion cavity in a shear-thinning manner with rapid hemostasis, high tissue adhesion and efficient self-healing. They tested this in an in vivo mouse model of brain lesions and found the multi-functional injectable hydrogel to support neural cell infiltration, decrease astrogliosis and glial scars, and close the lesions. The results suggest a role for extracellular matrix-mimicking viscoelasticity in brain lesion healing, and motivate additional experimentation in larger animals as the technology progresses towards potential application in humans [2].

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see 3D hydrogel.

see Hydrogel coated coil.

see Hybrid Gelatin Hydrogel.

Immunomodulatory hydrogel

Immunomodulatory hydrogel.

1)
https://www.sciencedirect.com/science/article/pii/S2090123213000969
2)
Hu Y, Jia Y, Wang S, Ma Y, Huang G, Ding T, Feng D, Genin GM, Wei Z, Xu F. An ECM-Mimicking, Injectable, Viscoelastic Hydrogel for Treatment of Brain Lesions. Adv Healthc Mater. 2022 Nov 18:e2201594. doi: 10.1002/adhm.202201594. Epub ahead of print. PMID: 36398536.