Hydrogels for tissue repair applications

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Abstract: Tissue engineering deals with the "process of replacing, engineering, regenerating or repairing tissues or organs to restore or establish normal function" where cells and/or combinations of cells with scaffolds and/or biologically active molecules are used to repair/regenerate a damaged tissue. Some of the challenges facing the success of cell-based therapies is its delivery and its survival at the wound site. Recent evidence indicates that the observed regeneration is more a result of migration of tissue repairing cells from adjoining tissues in response to paracrine factors secreted by implanted cells, than by the implanted cells per se. Several scaffolds are being studied to aid in the regenerative process. Of this, the use of hydrogels as scaffold appear to be one such promising approach. A hydrogel is a hydrophilic polymeric 3D network with high water content and is considered optimal to deliver cells and engineer damaged tissues. An ideal hydrogel should be able to spatially and temporally control its biochemical and biophysical characteristics in terms of release of biomolecules, mechanical stiffness, structure, and degradation. Smart hydrogels are promising delivery vehicles for cells and growth factors because of their responsiveness to various environmental stimuli, such as temperature, pH etc. Injectable hydrogels are especially promising because they provide possibilities for minimally invasive delivery procedures. Self-healing hydrogels are a specialized type of hydrogel that can undergo repair process and retain their integrity as well as mechanical properties after being destroyed. Recently, self-healing hydrogels have been developed with reversible cross-linkages and have been demonstrated to support cell implantation. With an emphasize on ensuring the paracrine response of the cells is supported by the hydrogel, we report the development of one such self-healing injectable hydrogel that can be used for repair of damaged tissues as per scheme

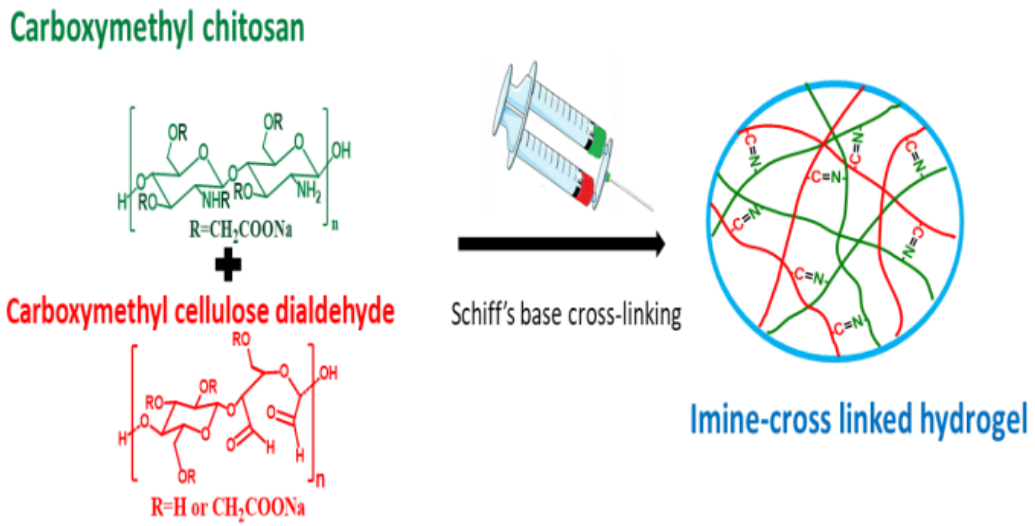

Figure 1: Schematic representation of self-healing property of the hydrogel.

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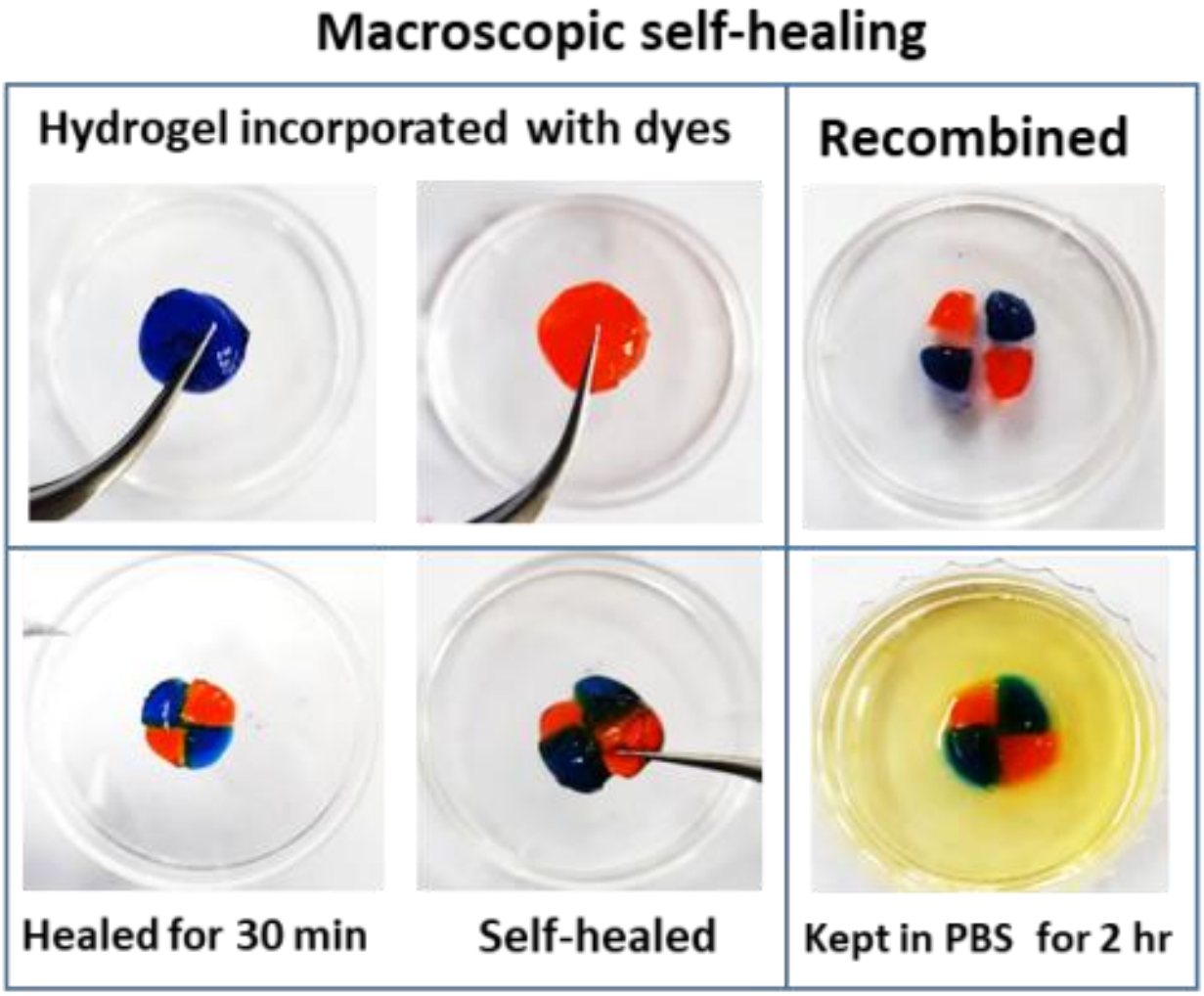

Figure 2: Self-.Healing property of the hydrogel.

Biography: Dr. Deepa Ghosh received her B. Pharm from Madras University (1989). She completed her M. Pharm. degree from BITS, Pilani (1991) and Ph.D. work in Uniformed Services University of Health Sciences, MD, USA and received her degree from BITS Pilani, in 1995. She completed her post-doctoral work from Department of Pharmacology, Emory Univ., GA, USA and joined the pharma industry in India. She has more than 18 years industrial experience and has been instrumental in developing several tissue engineering products that have been tested in clinical trials. To her credit she has several patents and products. Her main interest is in the development of low cost therapies for tissue repair and regeneration.

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