Hyaluronic Acid

Hyaluronic acid (HA), a linearly polysaccharide consisting of alternating B-1,4-D-glucoronic acid and B-1,3-N-acetyl-D-glucosamine units, is a primary component of numerous soft connective tissues, in addition to synovial fluid, the vitreous body, and the umbilical cord. HA is known to play a role in joint lubrication, cellular adhesion and migration, wound healing, and inflammation (1). As a result of its inherent biocompatibility, biodegradability, and bioactivity, HA has proven to be a versatile molecule in both drug delivery and tissue engineering applications.

Expression of HA binding receptors, such as CD-44 and RHAMM, is known to be up-regulated in various disease states, including cancer and inflammatory diseases. HA conjugates, nanoparticles, and microspheres have been widely used in the local and parenteral delivery of therapeutics to metastatic tissues that overexpress CD-44. The HA-drug vehicles permit co-internalization via receptor mediated endocytosis, thereby further increasing drug efficacy (2). Current investigations are exploring the use of similar HA based carriers in the treatment of other conditions (Fig. 1).
Hydrogels, meshes, and sponges formulated from HA are being used as scaffolds for tissue engineering applications, including stem cell differentiation (Fig. 2). HA can be modified and crosslinked to control degradation and alter the cellular response. Chondrocytes and mesenchymal stem cells, as well as neural progenitor cells, have been successfully incorporated into HA scaffolds (3-5). The scaffolds have also been used as depots for the controlled release of bioactive factors (6).

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References