Relaxation and diffusion of water protons in native and cross-linked hyaluronan by NMR spectroscopy

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Relaxation and self-diffusion of water protons in cross-linked hyaluronan (HA) hydrogels, as well as native HA solutions of different molecular weight, were investigated by NMR spectroscopy as a function of temperature. The studied hydrogels consist of three-dimensional polymer networks with different degrees of cross-linking and modification, using 1,4-butanediol diglycidyl ether (BDDE) as a cross-linker.[1] Physicochemical properties of HA hydrogels vary a lot and can be characterized by the degree of cross-linking, gel content, swelling ability, and rheological parameters, etc. Both the longitudinal relaxation time (T_1) and the diffusion coefficient (D) increased with rising temperature in a similar manner for all studied samples including a water reference. The transverse relaxation time (T_2) however changed dramatically among different concentrations and hydrogel types. At high-field NMR, the measured T_2 originates predominantly from chemical exchange between water protons and HA hydroxyl protons and will thereby represent the mobility of the polymer.

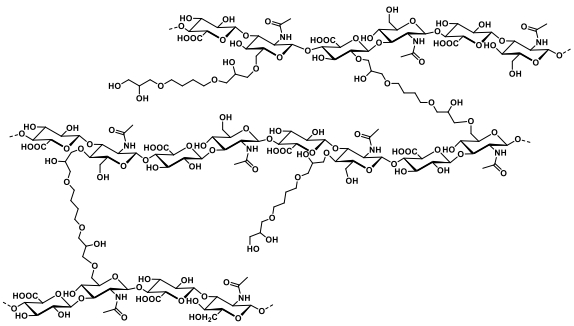

Figure 1. The chemical structure of BDDE cross-linked HA hydrogel.

[1] Wende, F. J., et al. *Carbohydrate Polymers*. **2017**, *157*, 1525-1530.